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As filed with the Securities and Exchange Commission on May 30, 2019.

Registration No. 333-

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM S-1
REGISTRATION STATEMENT
UNDER
THE SECURITIES ACT OF 1933

ADAPTIVE BIOTECHNOLOGIES CORPORATION

(Exact name of registrant as specified in its charter)

Washington	2836	27-0907024
(State or other jurisdiction of incorporation or organization)	(Primary Standard Industrial Classification Code Number)	(I.R.S. Employer Identification Number)

1551 Eastlake Avenue East, Suite 200
Seattle, Washington 98102
(206) 659-0067
(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

Chad Robins
Chief Executive Officer
1551 Eastlake Avenue East, Suite 200
Seattle, Washington 98102
(206) 659-0067
(Name, address, including zip code, and telephone number, including area code, of agent for service)

Copies to:

Andrew Ledbetter Tyler Hollenbeck Kevin Criddle DLA Piper LLP (US) 701 Fifth Avenue, Suite 6900 Seattle, Washington 98104 (206) 839-4800	Stacy Taylor General Counsel Adaptive Biotechnologies Corporation 1551 Eastlake Avenue East, Suite 200 Seattle, Washington 98102 (206) 659-0067	James Evans Robert Freedman Amanda Rose Fenwick & West LLP 1191 Second Avenue, Floor 10 Seattle, Washington 98101 (206) 389-4510

Approximate date of commencement of proposed sale to the public: As soon as practicable after this registration statement becomes effective.

If any of the securities being registered on this Form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933, check the following box: ☐

If this Form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, please check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering: ☐

If this Form is a post-effective amendment filed pursuant to Rule 462(c) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering: ☐

If this Form is a post-effective amendment filed pursuant to Rule 462(d) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering: ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b–2 of the Exchange Act.

Large accelerated filer	☐	Accelerated filer	☐
Non-accelerated filer	☒	Smaller reporting company	☐
		Emerging growth company	☒

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 7(a)(2)(B) of the Securities Act. ☐

CALCULATION OF REGISTRATION FEE

Title of Each Class of Securities to be Registered	Proposed Maximum Aggregate Offering Price[1][2]	Amount of Registration Fee
Common Stock, $0.0001 par value per share	$230,000,000	$27,876

(1) The proposed maximum aggregate offering price includes the offering price of additional shares that the underwriters have the option to purchase.
(2) Estimated solely for the purpose of calculating the registration fee in accordance with Rule 457(o) of the Securities Act of 1933, as amended.

The registrant hereby amends this registration statement on such date or dates as may be necessary to delay its effective date until the registrant shall file a further amendment which specifically states that this registration statement shall thereafter become effective in accordance with Section 8(a) of the Securities Act of 1933, as amended, or until the registration statement shall become effective on such date as the Commission, acting pursuant to said Section 8(a), may determine.

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The information in this preliminary prospectus is not complete and may be changed. These securities may not be sold until the registration statement filed with the Securities and Exchange Commission is effective. This preliminary prospectus is not an offer to sell nor does it seek an offer to buy these securities in any jurisdiction where the offer or sale is not permitted.

SUBJECT TO COMPLETION, DATED MAY 30, 2019

Shares

Common Stock

This is an initial public offering of shares of common stock of Adaptive Biotechnologies Corporation. We are offering shares of our common stock to be sold in this offering.

Prior to this offering, there has been no public market for our common stock. It is currently estimated that the initial public offering price per share will be between $ and $ per share.

We have applied to list our common stock on The Nasdaq Global Select Market under the symbol “ADPT.”

We are an “emerging growth company” as defined under the federal securities laws and, as such, have elected to comply with certain reduced public company reporting requirements for this prospectus and may elect to do so in future filings.

Investing in our common stock involves a high degree of risk. See the “Risk Factors” section beginning on page 13 of this prospectus to read about factors you should consider before buying shares of our common stock.

Neither the Securities and Exchange Commission nor any other regulatory body has approved or disapproved of the securities offered hereby, or passed upon the adequacy or accuracy of this prospectus. Any representation to the contrary is a criminal offense.

	Per share	Total
Initial public offering price	$	$
Underwriting discounts(1)	$	$
Proceeds, before expenses, to us	$	$

(1) See the “Underwriting” section of this prospectus for additional information regarding underwriting compensation.

To the extent that the underwriters sell more than shares of common stock, the underwriters have the option to purchase up to an additional shares from us at the initial public offering price less the underwriting discount.

The underwriters expect to deliver the shares against payment in New York, New York on , 2019.

Goldman Sachs & Co. LLC **J.P. Morgan** **BofA Merrill Lynch**

Cowen **Guggenheim Securities**

William Blair **BTIG**

Prospectus dated , 2019.

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You should rely only on the information contained in this prospectus and any free writing prospectus prepared by or on behalf of us or to which we have referred you. Neither we nor any of the underwriters have authorized anyone to provide you with information that is different. This prospectus is an offer to sell only the securities offered hereby and only under circumstances and in jurisdictions where it is lawful to do so. The information contained in this prospectus is accurate only as of the date of this prospectus, regardless of the time of delivery of this prospectus or of any sale of the securities offered hereby. Our business, financial condition, results of operations and prospects may have changed since that date.

Neither we nor any of the underwriters have taken any action that would permit this offering or possession or distribution of this prospectus in any jurisdiction where action for that purpose is required, other than in the United States. Persons who have come into possession of this prospectus in a jurisdiction outside the United States are required to inform themselves about and to observe any restrictions relating to this offering and the distribution of this prospectus.

PROSPECTUS SUMMARY

The following summary highlights information contained elsewhere in this prospectus. It may not contain all the information that may be important to you. You should read this entire prospectus carefully, including "Risk Factors" and "Management's Discussion and Analysis of Financial Condition and Results of Operations," and our historical financial statements and related notes, before making an investment decision. In this prospectus, unless the context requires otherwise, all references to "we," "our," "us," "Adaptive" and the "Company" refer to Adaptive Biotechnologies Corporation.

Overview

We are advancing the field of immune-driven medicine by harnessing the inherent biology of the adaptive immune system to transform the diagnosis and treatment of disease. We believe the adaptive immune system is nature's most finely tuned diagnostic and therapeutic for most diseases, but the inability to decode it has prevented the medical community from fully leveraging its capabilities. Our immune medicine platform applies our proprietary technologies to read the diverse genetic code of a patient's immune system and understand precisely how it detects and treats disease in that patient. We capture these insights in our dynamic clinical immunomics database, which is underpinned by computational biology and machine learning, and use them to develop and commercialize clinical products and services that we are tailoring to each individual patient. We have two commercial products and services and a robust pipeline of clinical products and services that we are designing to diagnose, monitor and enable the treatment of diseases such as cancer, autoimmune conditions and infectious diseases. Since our inception in 2009, we have characterized over 20 billion immune receptors, established partnerships and commercial relationships with over 125 biopharmaceutical companies and launched two product lines. Our goal is to understand the adaptive immune system and translate it into new products with unprecedented scale, precision and speed.

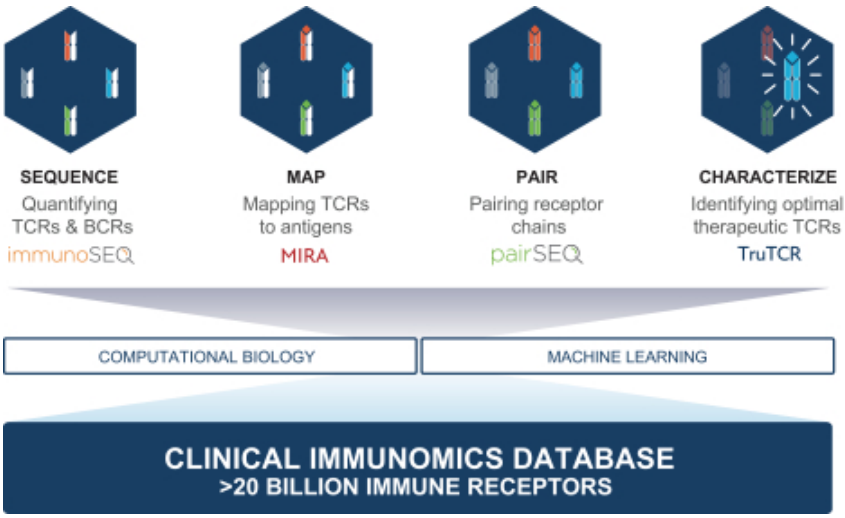
Our immune medicine platform is the foundation for our expanding suite of products and services. The cornerstone of our platform and core immunosequencing product, immunoSEQ, serves as our underlying research and development engine and generates revenue from academic and biopharmaceutical customers. Our first clinical diagnostic product, clonoSEQ, is the first test authorized by the FDA for the detection and monitoring of minimal residual disease in patients with select blood cancers. Leveraging our collaboration with Microsoft, we are also developing a diagnostic product, immunoSEQ Dx, that may enable early detection of many diseases from a single blood test. Our therapeutic product candidates, being developed under our collaboration agreement with Genentech, leverage our platform to identify specific immune cells to develop into cellular therapies in oncology. We believe this approach has the potential to be applicable to patients across a wide range of cancers.

Immune-driven medicine is one of the largest global addressable markets in healthcare. We estimate the potential market opportunity for our portfolio to be greater than $48 billion, including research products, clinical diagnostics and cellular therapies. We believe this market will grow over time as clinicians increasingly appreciate the importance of the immune system in the diagnosis and treatment of disease and as our pipeline of products and services continues to expand.

Our Immune Medicine Platform

The adaptive immune system is comprised of specialized cells, called T cells and B cells, which hold the instructions for diagnosing and treating most diseases. These instructions enable these cells to identify, bind and destroy pathogens or human cells presenting foreign signals of disease ("antigens") using receptors on their cell surface. Unlike all other genes in the human genome, the

genetic sequences of T cell receptors ("TCRs") and B cell receptors ("BCRs") rearrange over time, creating massive genetic diversity. The resulting diversity of the adaptive immune repertoire, which consists of over 100 million different genes in a healthy adult compared to approximately 30,000 genes in the static human genome, gives the immune system the ability to detect and respond to millions of different antigens associated with human disease. A platform that fully reveals the enormous diversity and scale of the immune system to develop clinical products must be able to reliably and repeatedly measure the relative frequency of each disease-specific immune cell, even those present in blood at only 1 out of 1,000,000 cells.



Our immune medicine platform performs the following key functions related to immune receptors:

- *Sequence.* immunoSEQ sequences single chains of "Y-shaped" TCRs or BCRs using next-generation sequencing ("NGS"), enabling us to understand the quantity and diversity of T and B cells in a biological sample. This provides deep insights into individual and collective immune responses at a scale that is thousands of times greater than was previously possible.
- *Map.* MIRA (Multiplexed Identification of T cell Receptor Antigen Specificity) maps millions of TCRs to thousands of clinically relevant antigens. Combined with immunoSEQ, MIRA elucidates what potential diseases a patient's immune system has been exposed to or is actively fighting.
- *Pair.* pairSEQ builds on immunoSEQ by using a combinatorial strategy to accurately pair both chains of Y-shaped immune cell receptors at high-throughput, which is challenging to do at scale using other methods because the two chains of the Y-shaped receptors are located on different chromosomes. The ability to accurately pair both chains of the receptors in a sample enables us to reconstruct receptors for therapeutic purposes.
- *Characterize.* TruTCR characterizes binding, cytotoxicity and safety properties of antigen-specific, paired TCRs to identify a subset that is therapeutic-grade, enabling the discovery and development of optimal clinical candidates to be engineered into TCR-mediated cellular therapies.

The massive amount of data generated by our immune medicine platform is stored in our dynamic clinical immunomics database of over 30 billion immune receptors, of which we have data

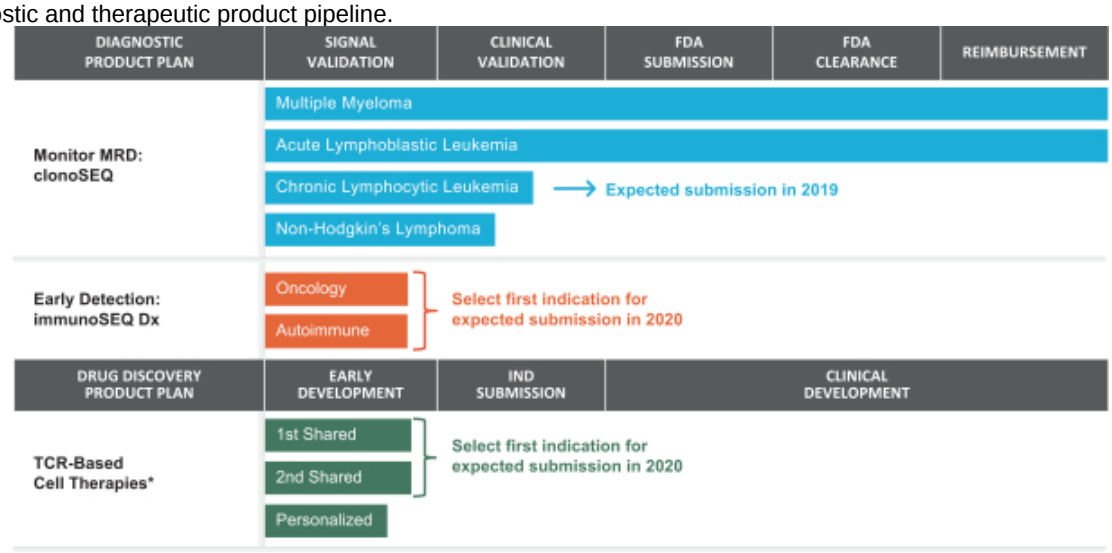
rights to over 20 billion. We believe the application of machine learning, supported by our collaboration with Microsoft, has the potential to exponentially accelerate our ability to derive novel insights from this database and use them to inform our robust product development efforts.

Our Current Products and Pipeline

Our current portfolio includes commercial products and services in life sciences research and clinical diagnostics, and we are developing products and services in both clinical diagnostics and drug discovery.

Life Sciences Research. Our immunoSEQ research service and kit are used to answer research questions that inform current and future clinical trials ("translational research") and to discover new prognostic and diagnostic signals. Our technology has been used for research purposes by over 2,000 academic researchers and more than 125 biopharmaceutical companies and incorporated into over 480 clinical trials since our inception in 2009. We intend to initiate development of a next generation, sample-type agnostic research use only ("RUO") kit, which we expect to enable global distribution of our research product. We are working to analytically validate the improved version of immunoSEQ so that all research data generated using immunoSEQ can be used for clinical validation of potential diagnostic applications.

We also use immunoSEQ for our own internal clinical product development efforts as the foundational technology for our clinical diagnostic and therapeutic product pipeline.



* Product candidates in development as part of our worldwide collaboration and license agreement with Genentech. The "1st Shared" and "2nd Shared" product candidates refer to the two lead product candidates selected from our library of TCRs that target cancer antigens present in many cancer patients. Genentech will determine the timing of discussions with, and submissions to, the FDA.

Clinical Diagnostics. Our clonoSEQ diagnostic test detects and monitors the remaining number of cancer cells that are present in a patient's body during and after treatment, known as minimal residual disease ("MRD"). clonoSEQ was granted marketing authorization from the U.S. Food and Drug Administration ("FDA") under the *de novo* process, in September 2018 for patients with multiple

myeloma (“MM”) and B cell acute lymphoblastic leukemia (“ALL”) to monitor their MRD from bone marrow samples. In January 2019, clonoSEQ received Medicare coverage aligned with the FDA label and National Comprehensive Cancer Network (“NCCN”) guidelines for longitudinal monitoring in MM and ALL, and subsequently clonoSEQ received coverage from three private payors representing approximately 68 million covered lives. clonoSEQ is also available for use in other lymphoid cancers as a laboratory developed test (“LDT”). clonoSEQ testing has been ordered by clinicians in nearly 300 healthcare systems and institutions, including 27 of the 28 NCCN centers in the United States, and used by more than 30 biopharmaceutical companies in over 120 clinical trials. We continue to invest in the commercial success of clonoSEQ by establishing a specialized sales organization and infrastructure in the United States and by exploring partnerships with diagnostic companies in other parts of the world. We believe clonoSEQ has broad applicability and we intend to file to expand the clonoSEQ FDA label to multiple additional indications, starting with chronic lymphocytic leukemia (“CLL”) in 2019, followed by non-Hodgkin’s lymphomas (“NHL”), to further expand its usage. Importantly, we are also generating data for submission to validate the use of clonoSEQ to monitor MRD from blood samples, which is less invasive than bone marrow samples, and may facilitate more frequent monitoring and broader physician adoption.

Leveraging Microsoft Corporation’s (“Microsoft”) machine learning capabilities to create a map of the interaction between the immune system and disease (“TCR-Antigen Map”), we are developing a diagnostic product, immunoSEQ Dx, that may enable early detection of many diseases from a single blood test. In 2019, we plan to confirm the first indications to bring to the FDA for review in 2020 while continuing signal validation in several additional indications. We believe we are uniquely positioned to rapidly identify signals for early detection across many disease states simultaneously because our immune medicine platform works with retrospective sample sets and uses machine learning and computational statistics to continuously improve our detection and accuracy without requiring large cohorts of prospective patients.

Drug Discovery. Our TruTCR process characterizes TCRs against shared antigens for use in the development of therapeutics. In December 2018, we entered into an exclusive collaboration with Genentech, Inc. (“Genentech”) to leverage this capability for the development of cellular therapies in oncology. We are pursuing two product development pathways for novel T cell immunotherapies in which Genentech intends to use TCRs screened by our immune medicine platform to engineer and manufacture cellular medicines:

- *Shared Products.* The shared products will use “off-the-shelf” TCRs identified against cancer antigens shared among patients (“Shared Products”).
- *Personalized Product.* The personalized product will use patient-specific TCRs identified by real-time screening of TCRs against cancer antigens in each patient (“Personalized Product”).

We expect to begin discussions with the FDA during the fourth quarter of 2019, with a view to making an investigational new drug (“IND”) submission by the fourth quarter of 2020. Genentech will determine the actual timing of discussions with, and submissions to, the FDA. In parallel, we plan to evaluate an investment in facilities for the screening of patient-specific TCRs to shorten the time from patient blood draw to infusion of the Personalized Product. We believe this investment would position us to potentially pursue additional opportunities outside of this collaboration, including cellular therapy in other disease states and cancer vaccines.

Our Competitive Strengths

We aim to harness the inherent biology of the adaptive immune system to develop clinical products and services that improve human health by leveraging our core competitive strengths.

- *Our immune medicine platform is uniquely capable of supporting clinical products.* We have developed a platform that is capable of reading and translating the massive genetic diversity of the adaptive immune system and its selective response to disease. Specifically, our platform *sequences* immune receptors and *maps* them to antigens for diagnostic applications, *pairs* receptor chains and *characterizes* antigen-specific, paired receptors to identify optimal clinical targets for therapeutic use. We are the only company that can perform all of these functions—and we do so at an unprecedented scale to develop novel clinical diagnostic and therapeutic products.
- *Our clinical immunomics database provides a robust product development engine.* Our dynamic clinical immunomics database of over 20 billion immune receptors, now being annotated with antigens using machine learning, drives our ability to rapidly discover and develop potential diagnostic and therapeutic applications. Our aim is to translate the natural capabilities of the immune system into the clinic by capturing the millions of diverse unique receptors present in a patient's blood.
- *Clinical applicability spans diagnostic and therapeutic product potential.* Our ability to accumulate, synthesize and process billions of immunomic datapoints to generate multiple clinical diagnostic and therapeutic applications across disease areas provides optionality to our commercial pipeline. Each of our products also has broad applicability, enabling robust product lifecycle extensions.
- *Regulatory and reimbursement expertise will help inform future clinical product development.* Having successfully obtained FDA marketing authorization, and coverage for clonoSEQ from Medicare and three private payors, we believe we have developed valuable core capabilities that will facilitate future product development through to regulatory approval and reimbursement. We believe this capability will inform future development of other clinical products, including our early detection tests.
- *Transformational collaborations with industry leaders validate our platform.* Our collaborations with industry-defining leaders such as Genentech and Microsoft validate our unique approach to advancing the promise of immune-driven medicine. We will continue to seek opportunities to optimize our ever-growing clinical immunomics database to drive product development and commercial success and facilitate efficient use of capital.
- *Strong intellectual property protects our immune medicine platform and its applications.* We have filed 375 patent applications, 234 of which have issued as of March 31, 2019, covering improvements in sequencing methods and new ways to leverage adaptive immune receptors for life sciences research, clinical diagnostic and drug discovery applications.

Our Strategy

Our focus is to leverage our immune medicine platform and competitive strengths to develop transformative clinical solutions accessible to patients around the world.

- *Advance the promise of immune-driven medicine.* We facilitate the development of the immune medicine field by providing a platform to encourage generation of immunomics data to facilitate a deeper understanding of, and biological discovery from, the adaptive immune system. We leverage the unique capability of our platform to translate a patient's immune system with the

scale, precision and speed required to enable the development of personalized products, including clinical diagnostic tests for disease monitoring and early detection, as well as immune-based therapeutics.

- *Rapidly identify and advance new products, leveraging foundational technology.* Integrate proven chemistry into our clinical products in development, avoiding the need to re-engineer new products for every clinical application. We do this by serially identifying new applications of immunoSEQ Dx for early detection of disease using retrospective datasets without requiring live cells from large cohorts of patients, and by characterizing TCRs for therapeutic use. As our platform expands into new indications across cancer, autoimmune conditions and infectious diseases, we believe we will benefit from economies of scale and drive margin improvement over time.
- *Entrench our products and services in clinical drug development with biopharmaceutical collaborators.* Position our platform as the gold standard for the validation of potential immune-driven clinical discoveries in late-stage clinical trials. Since inception, our products and services have been used by more than 125 biopharmaceutical companies and incorporated into over 480 clinical trials, and clonoSEQ has proven to be the MRD test of choice for select registrational trials. To deepen our established position as a partner of choice, we provide end-to-end support, including hypothesis-driven trial design, extensive data analyses, parallel regulatory support, compliant data transfers and novel target screening. These synergistic relationships advance the development and adoption of our own clinical products and also inform drug development for our partners.
- *Drive the commercial adoption of distributed, reimbursed and regulated clinical products.* Expand distribution and drive usage of our products and services, including the development of clinical *in vitro* diagnostic ("IVD") kits. Leverage the commercial infrastructure built for clonoSEQ to submit clinical data for regulatory clearance of our products and services, expand current payor coverage and provide robust billing and patient access infrastructure for multiple clinical applications.
- *Maintain an entrepreneurial, scientifically rigorous, data-driven and inclusive corporate culture.* Fuel the promise and potential that our platform offers to help patients better manage their disease by translating insights from our world-class team, which includes 79 people with medical or doctoral degrees with expertise in biology, chemistry, bioinformatics, software, drug discovery, development and commercialization, into clinical products and services. We plan to continue to expand our team to advance the promise of immune-driven medicine.

Risks Associated with Our Business

Our business is subject to a number of risks and uncertainties of which you should be aware before making an investment decision, including those highlighted in the "*Risk Factors*" section of this prospectus immediately following this prospectus summary. Among others, these risks relate to:

- our significant net losses since inception, expected net losses in the future and need for significant investments in products and services;
- our ability to leverage our immune medicine platform to discover, develop, commercialize and obtain regulatory clearance, authorization and approval for our products and services, particularly in light of the novelty of immune medicine and our methods;
- our ability to develop our TCR-Antigen Map and yield insights from it that are commercially viable;

- our collaboration with Genentech and ability to develop and commercialize cellular therapeutics, including our ability to achieve milestones and realize the intended benefits of the collaboration;
- our laboratory operations, including errors or defects in our products or services and our reliance on a limited number of suppliers, and in some cases single suppliers, for our equipment and materials;
- our limited experience with the development and commercialization of cellular therapeutics;
- market acceptance of our products and services, and our limited sales and marketing experience;
- our expected reliance on collaborators for development and clinical testing of therapeutic product candidates, which may fail at any time due to a number of possible unforeseen events;
- our ability to increase our capacity, manage the evolution of our products and services, stay current in our rapidly changing industry, expand our workforce and otherwise manage our growth;
- the loss of any member of our senior management team, or of the support of key opinion leaders;
- the extensive regulation of our industry, including reimbursement coverage decisions; and
- the validity of our patents, protection of our trade secrets and related intellectual property matters.

See the "*Risk Factors*" section of this prospectus for additional information about the risks we face.

Implications of Being an Emerging Growth Company

We are an "emerging growth company" as defined in the Jumpstart Our Business Startups Act of 2012 ("JOBS Act"). As such, we may take advantage of reduced disclosure and other requirements otherwise generally applicable to public companies, including:

- presenting only two years of audited financial statements and related financial disclosure;
- not being required to have our registered independent public accounting firm attest to management's assessment of our internal control over financial reporting;
- presenting reduced disclosure about our executive compensation arrangements; and
- not being required to hold non-binding advisory votes on executive compensation or golden parachute arrangements.

We have taken advantage of some of these reduced disclosure and other requirements and, pursuant to Section 107 of the JOBS Act, we have elected to take advantage of the extended transition period for complying with new or revised accounting standards until those standards would otherwise apply to private companies. Accordingly, the information we provide to you may be different than you might get from other public companies in which you hold securities.

We will remain an emerging growth company until the earliest of (i) the last day of the fiscal year following the fifth anniversary of the closing of this offering, (ii) the last day of the fiscal year in which we have total annual gross revenue of at least $1.07 billion, (iii) the last day of the fiscal year in which we are deemed to be a "large accelerated filer" as defined in Rule 12b-2 under the Securities Exchange Act of 1934, as amended ("Exchange Act"), which would occur if the market value of our

common stock held by non-affiliates exceeded $700.0 million as of the last business day of the second fiscal quarter of such year or (iv) the date on which we have issued more than $1.0 billion in non-convertible debt securities during the prior three-year period.

Corporate Information

We were incorporated in the State of Washington on September 8, 2009 under the name Adaptive TCR Corporation. On December 21, 2011, we changed our name to Adaptive Biotechnologies Corporation. In January 2015, we acquired Sequenta, Inc. ("Sequenta"), a San Francisco, California-based company that was also developing an NGS test for MRD ("Sequenta Acquisition"). Our principal executive offices are located at 1551 Eastlake Avenue East, Suite 200, Seattle, Washington 98102, and our telephone number is (206) 659-0067. We maintain a website at www.adaptivebiotech.com. Information contained on or that can be accessed through our website is neither a part of, nor incorporated by reference into, this prospectus, and you should not consider information on our website to be part of this prospectus.

We own various U.S. federal trademarks, applications and unregistered trademarks, including our company name, product and service names and other trade or service marks. All other trademarks or trade names referred to in this prospectus are the property of their respective owners. Solely for convenience, the trademarks and trade names in this prospectus are referred to without the symbols ® and ™, but such references should not be construed as any indicator that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto.

THE OFFERING

Common stock offered by us	shares
Option to purchase additional shares	We have granted the underwriters an option to purchase up to additional shares of common stock from us. The underwriters can exercise this option at any time within 30 days from the date of this prospectus.
Common stock to be outstanding immediately after this offering	shares (or shares if the underwriters exercise in full their option to purchase additional shares).
Use of proceeds	We estimate that the net proceeds from this offering will be approximately $ million, or $ million if the underwriters exercise in full their option to purchase additional shares of our common stock, assuming an initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, after deducting the estimated underwriting discounts and commissions and estimated offering expenses. We expect to use the net proceeds from this offering primarily to fund commercial and marketing activities associated with our clinical products and services, continued research and development for our drug discovery initiatives and ongoing investments in our TCR-Antigen Map related activities. We expect to use the remainder, if any, to scale our laboratory operations with our anticipated growth, for working capital and for other general corporate purposes. For a more complete description of our intended use of the proceeds from this offering, see the "*Use of Proceeds*" section of this prospectus.
Risk Factors	See the "*Risk Factors*" section of this prospectus and other information included in this prospectus for a discussion of factors that you should consider carefully before deciding to invest in our common stock.
Proposed Nasdaq Global Select Market symbol	"ADPT"

The number of shares of common stock to be outstanding after this offering is based on 105,974,230 shares of common stock outstanding as of March 31, 2019, which includes (i) the conversion of all outstanding shares of our convertible preferred stock into an aggregate of 93,023,694 shares of our common stock upon the closing of this offering and (ii) the issuance of 20,000 shares of common stock upon the exercise of an outstanding common stock warrant immediately prior to the closing of this offering that would otherwise expire, and excludes:

- 56,875 shares of common stock issuable upon the exercise of a warrant to purchase shares of convertible preferred stock outstanding as of March 31, 2019, with an exercise price of $2.64 per share;
- 35,032 shares of common stock issuable upon the exercise of a warrant to purchase shares of common stock outstanding as of March 31, 2019, with an exercise price of $0.33 per share;

- 31,077 shares of common stock issuable upon the exercise of stock options to purchase shares of convertible preferred stock outstanding as of March 31, 2019, under our Sequenta, Inc. 2008 Stock Plan ("Sequenta Plan"), which we assumed in connection with our Sequenta Acquisition, with a weighted-average exercise price of $0.60 per share;
- 16,851,722 shares of common stock issuable upon the exercise of stock options outstanding as of March 31, 2019, under our 2009 Equity Incentive Plan ("2009 Plan"), with a weighted-average exercise price of $4.95 per share, and 1,657,181 shares of common stock issuable upon the exercise of stock options issued after March 31, 2019, under our 2009 Plan, with a weighted-average exercise price of $7.80 per share;
- shares of common stock that will become available for future issuance under our 2019 Equity Incentive Plan ("2019 Plan") (which includes all shares reserved for issuance under our 2009 Plan) upon the effectiveness of the registration statement of which this prospectus forms a part; and
- shares of common stock that will become available for future issuance under our 2019 Employee Stock Purchase Plan ("ESPP") upon the effectiveness of the registration statement of which this prospectus forms a part.

Unless otherwise indicated, all information in this prospectus assumes or gives effect to:

- the filing of our amended and restated articles of incorporation and the effectiveness of our amended and restated bylaws upon the closing of this offering;
- the conversion of all outstanding shares of convertible preferred stock into an aggregate of 93,023,694 shares of common stock upon the closing of this offering;
- the conversion of an outstanding warrant to purchase our convertible preferred stock into a warrant to purchase an aggregate of 56,875 shares of our common stock upon the closing of this offering;
- the conversion of all outstanding stock options to purchase our convertible preferred stock into stock options to purchase an aggregate of 31,077 shares of our common stock upon the closing of this offering;
- no exercise or termination of outstanding options or warrants after March 31, 2019; and
- no exercise by the underwriters of their option to purchase up to additional shares of common stock in this offering.

SUMMARY FINANCIAL DATA

The summary financial data set forth below should be read together with our financial statements and the related notes to those statements, as well as the "*Selected Financial Data*" and "*Management's Discussion and Analysis of Financial Condition and Results of Operations*" sections of this prospectus. The statements of operations data for the years ended December 31, 2017 and 2018 have been derived from our audited financial statements included elsewhere in this prospectus. The statements of operations data for the three months ended March 31, 2018 and 2019 and the balance sheet data as of March 31, 2019 have been derived from our unaudited condensed financial statements included elsewhere in this prospectus, which have been prepared on the same basis as our audited financial statements. In the opinion of management, our unaudited condensed financial statements reflect all adjustments, consisting only of normal recurring adjustments, necessary for a fair statement of the financial information in those statements. Our historical results are not necessarily indicative of the results that may be expected in the future, and the results for the three months ended March 31, 2019 are not necessarily indicative of results to be expected for the full year ending December 31, 2019 or any other period.

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
	(in thousands, except share and per share data)			
Statements of Operations Data:				
Revenue				
Sequencing revenue	$ 22,759	$ 32,978	$ 5,780	$ 6,083
Development revenue	15,689	22,685	3,935	6,583
Total revenue	38,448	55,663	9,715	12,666
Operating expenses				
Cost of revenue	15,680	19,668	3,989	4,988
Research and development	31,995	39,157	8,855	12,483
Sales and marketing	16,765	24,486	5,047	7,817
General and administrative	15,949	20,409	4,543	7,004
Amortization of intangible assets	1,694	1,699	419	419
Restructuring	840	—	—	—
Total operating expenses	82,923	105,419	22,853	32,711
Loss from operations	(44,475)	(49,756)	(13,138)	(20,045)
Interest and other income, net	1,644	3,309	747	1,659
Net loss	(42,831)	(46,447)	(12,391)	(18,386)
Fair value adjustment to Series E-1 convertible preferred stock options	135	102	$ 4	$ (254)
Net loss attributable to common shareholders	$ (42,696)	$ (46,345)	$ (12,387)	$ (18,640)
Net loss per share attributable to common shareholders, basic and diluted	$ (3.50)	$ (3.67)	$ (1.01)	$ (1.45)
Weighted-average shares used in computing net loss per share attributable to common shareholders, basic and diluted	12,196,998	12,629,778	12,292,563	12,886,087
Unaudited pro forma net loss per share attributable to common shareholders, basic and diluted[1]		$ (0.44)		$ (0.18)
Unaudited weighted-average shares used in computing pro forma net loss per share attributable to common shareholders, basic and diluted		105,433,645		105,880,665
Other Financial and Operating Data (unaudited):				
Adjusted EBITDA[2]	$ (30,830)	$ (32,607)	$ (8,585)	$ (15,216)

(1) See Note 17 to our audited financial statements and Note 12 to our unaudited condensed financial statements appearing at the end of this prospectus for details on the calculation of basic and diluted net loss per share and the calculation of basic and diluted pro forma net loss per share.

(2) Adjusted EBITDA is a non-GAAP financial measure that we define as net loss adjusted for interest and other income, net, income tax benefit (expense), depreciation and amortization, restructuring charges and share-based compensation expenses. See the "*Selected Financial Data*" section of this prospectus for a reconciliation between Adjusted EBITDA and net loss, the most directly comparable United States generally accepted accounting principle ("GAAP") financial measure, and a discussion about the limitations of Adjusted EBITDA.

	As of March 31, 2019		
	Actual	Pro Forma(1)	Pro Forma As Adjusted(2)(3)
		(unaudited) (in thousands)	
Balance Sheet Data:			
Cash, cash equivalents and marketable securities	$ 440,431	$ 440,440	$
Working capital(4)	395,888	395,897	
Total assets	614,575	614,584	
Total liabilities	326,839	326,486	
Convertible preferred stock	561,210	—	—
Total shareholders' (deficit) equity	(273,474)	288,098	

(1) Pro forma amounts give effect to: (i) the automatic conversion of all of our outstanding shares of convertible preferred stock into an aggregate of 93,023,694 shares of common stock, immediately upon the closing of this offering; (ii) the issuance of 20,000 shares of our common stock upon the exercise of an outstanding warrant to purchase our common stock, immediately prior to the closing of this offering that would otherwise expire; and (iii) the conversion of an outstanding warrant to purchase our convertible preferred stock into a warrant to purchase an aggregate of 56,875 shares of our common stock upon the closing of this offering.

(2) Pro forma, as adjusted amounts reflect pro forma adjustments described in footnote (1) as well as the sale of shares of our common stock in this offering at an assumed initial public offering price of $ per share of common stock, the midpoint of the price range set forth on the cover page of this prospectus, and after deducting the estimated underwriting discounts and commissions and estimated offering expenses.

(3) Each $1.00 increase (decrease) in the assumed initial public offering price of $ per share of common stock, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) our pro forma as adjusted amounts of each of cash, cash equivalents and marketable securities, working capital, total assets and total shareholders' (deficit) equity by approximately $ million, assuming that the number of shares of common stock offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting the estimated underwriting discounts and commissions. We may also increase or decrease the number of shares we are offering. Each increase (decrease) of 1,000,000 shares in the number of shares of common stock offered by us would increase (decrease) our pro forma as adjusted amounts of each of cash, cash equivalents and marketable securities, working capital, total assets and total shareholders' (deficit) equity by approximately $ million, assuming that the assumed initial price to the public remains the same, and after deducting the estimated underwriting discounts and commissions.

(4) We define working capital as current assets less current liabilities.

RISK FACTORS

Investing in our common stock involves a high degree of risk. You should carefully consider the following risks and uncertainties, together with all other information in this prospectus, including our financial statements and related notes and the "Management's Discussion and Analysis of Financial Condition and Results of Operations" section of this prospectus before investing in our common stock. Any of the risk factors we describe below could adversely affect our business, financial condition, results of operations or prospects. The market price of our common stock could decline if one or more of these risks or uncertainties actually occur, causing you to lose all or part of your investment in our common stock. Additional risks that we currently do not know about or that we currently believe to be immaterial may also impair our business, financial condition, operating results and prospects.

Risks Relating to Our Business

We have incurred significant losses since inception, we expect to incur losses in the future and we may not be able to generate sufficient revenue to achieve and maintain profitability.

We have incurred significant losses since our inception. For the years ended December 31, 2017 and 2018 and the three months ended March 31, 2019, we incurred net losses of $42.8 million, $46.4 million and $18.4 million, respectively. As of December 31, 2018 and March 31, 2019, we had an accumulated deficit of $295.9 million and $314.5 million, respectively. We have funded our operations principally from the sale of our convertible preferred stock, and to a lesser extent sequencing and development revenue. We have devoted most of our financial resources to the research and development of products and services under our immune medicine platform. We expect to continue to incur significant expenses and operating losses for the foreseeable future as we continue to invest in the development of products and services utilizing our immune medicine program to support the validation of additional clinical diagnostic and therapeutic products and services. In addition, following the closing of this offering, we expect to incur additional costs associated with operating as a public company, including expenses related to legal, accounting, regulatory, maintaining compliance with exchange listing and Securities and Exchange Commission ("SEC") requirements, director and officer insurance premiums and investor relations. We will need to generate significant additional revenue to achieve and sustain profitability. Our failure to achieve or sustain profitability could negatively impact the value of our common stock.

We expect to make significant investments in our continued research and development of new products and services, which may not be successful.

We are seeking to leverage our immune medicine platform to develop a pipeline of future disease-specific research, diagnostic and therapeutic products and services. For example, we are attempting to extend clonoSEQ into additional indications and sample types, and we are developing our TCR-Antigen Map with a view toward developing immunoSEQ Dx, a diagnostic test that may enable early detection of multiple diseases from a single blood test. In addition, we are developing certain therapeutic product candidates under our collaboration agreement with Genentech by leveraging our platform to identify TCRs that can be engineered into personalized cellular immunotherapies. We expect to incur significant expenses to advance these development efforts, but they may not be successful.

Developing new products and services is a speculative and risky endeavor. Products or services that initially show promise may fail to achieve the desired results or may not achieve acceptable levels of analytical accuracy or clinical utility. We may need to alter our products in development and repeat clinical studies before we identify a potentially successful product or service. Product development is expensive, may take years to complete and can have uncertain outcomes. Failure can occur at any stage of the development. If, after development, a product or service appears successful, we or our

collaborators may, depending on the nature of the product or service, still need to obtain FDA and other regulatory clearances, authorizations or approvals before we can market it. The FDA's clearance, authorization or approval pathways are likely to involve significant time, as well as additional research, development and clinical study expenditures. The FDA may not clear, authorize or approve any future product or service we develop. Even if we develop a product or service that receives regulatory clearance, authorization or approval, we or our collaborators would need to commit substantial resources to commercialize, sell and market it before it could be profitable, and the product or service may never be commercially successful. Additionally, development of any product or service may be disrupted or made less viable by the development of competing products or services.

New potential products and services may fail any stage of development or commercialization and if we determine that any of our current or future products or services are unlikely to succeed, we may abandon them without any return on our investment. If we are unsuccessful in developing additional products or services, our potential for growth may be impaired.

If we are not successful in leveraging our immune medicine platform to discover, develop and commercialize additional products and services, our ability to expand our business and achieve our strategic objectives would be impaired.

A key element of our strategy is to leverage our immune medicine platform to discover, develop and potentially commercialize additional products and services beyond our current portfolio to diagnose and treat various disease states. In particular, for clonoSEQ we are attempting to generate sufficient clinical evidence to support a new regulatory submission to add additional lymphoid cancers beyond ALL and MM, while also adding blood as a validated sample type. If we are unable to extend clonoSEQ into other indications or to use additional sample types, our platform may face a broader obstacle to using our immunosequencing data for commercially viable products and services.

Identifying new products and services requires substantial technical, financial and human resources, whether or not any products or services are ultimately developed or commercialized. We may pursue what we believe is a promising opportunity to leverage our platform only to discover that certain of our risk or resource allocation decisions were incorrect or insufficient, or that individual products, services or our science in general has technology or biology risks that were previously unknown or underappreciated. Our strategy of pursuing the value of our immune medicine platform over a long time horizon and across a broad array of human diseases may not be effective. In the event material decisions in any of these areas turn out to be incorrect or sub-optimal, we may experience a material adverse impact on our business and ability to fund our operations and we may never realize what we believe is the potential of our immune medicine platform.

Our efforts to develop our TCR-Antigen Map may not be successful, and it may not yield the insights we expect at all or on a timetable that allows us to develop or commercialize any new diagnostic products.

We are leveraging our collaboration with Microsoft to develop our TCR-Antigen Map. Together we are using immunosequencing, proprietary computational modeling and machine learning to map TCR sequences to the antigens they bind. However, we may not be successful in developing a comprehensive TCR-Antigen Map for any number of reasons. Our collaboration with Microsoft is in the early stages, and our computations and algorithmic-based methods are largely untested and may not allow us to accurately pair TCR sequences to a meaningful number of antigens. As a result, it may require significantly more time and resources for us to determine how to use machine learning to accelerate our mapping process, which could adversely impact our ability to develop or commercialize new diagnostic products or services. In addition, even with the aid of machine learning, we expect the TCR-Antigen Map to take us several years to develop.

The TCR-Antigen Map we are developing may not yield clinically actionable insights on a timetable that is commercially viable, or at all. Our goal is to leverage the TCR-Antigen Map to develop a diagnostic product, immunoSEQ Dx, that may enable early detection of many diseases from a single blood test. However, we are still validating early detection testing for a set of discrete diseases where antigen specificity is well-known, and we do not expect to validate more than one indication in 2019. If our computational modeling and machine learning efforts do not accelerate the pace at which we can validate association of TCR sequences to the antigens they bind, the timetable for our business model may not be commercially viable. Even if we can accelerate this timeline, our products and services derived from our novel technologies may have product or service level errors. If we are unable to make meaningful progress in our TCR-Antigen Map and successfully use it to develop and commercialize new diagnostic products or services, our business and results of operations will suffer.

We are exposed to risks associated with our agreement with Genentech, and we may not realize the advantages we expect from it.

In December 2018, we entered into a worldwide collaboration and license agreement with Genentech ("Genentech Agreement"), with the goal of accelerating the development and commercialization of novel cancer-specific antigen and neoantigen directed T cell therapies for the treatment of a broad range of tumor types. Under the terms of the Genentech Agreement, we received $300.0 million in an initial upfront payment in February 2019, and may receive approximately $1.8 billion in additional payments over time upon achievement of specified development, regulatory and commercial milestones. In addition, Genentech will pay us royalties on sales of products commercialized under the agreement. We may not be successful in achieving these milestones, and products developed under the Genentech Agreement may not be commercialized in the timeframe we expect, achieve significant sales, or be commercialized at all.

We are exposed to numerous risks associated with the Genentech Agreement, including sharing a measure of control over the operations of our research and development portions of the collaboration with Genentech and Genentech having sole control over the commercialization of any products developed via the collaboration. The Genentech Agreement also prevents us from, among other things, developing or commercializing TCR-based cellular therapies outside the scope of the collaboration in the field of oncology on our own or with any third party. Our collaboration involves risks that are different from the risks involved in independently conducting operations, including that Genentech may:

- have or develop economic or business interests that are inconsistent with ours;
- take actions contrary to our instructions, requests, policies or objectives;
- take actions that reduce our return on investment for this collaboration;
- fail to distinguish itself from biosimilar competition; or
- take actions that harm our reputation or restrict our ability to run our business.

Genentech's degree of control over collaboration development and commercialization efforts may impact the amounts we receive under the Genentech Agreement. For example, Genentech may decide not to pursue commercialization of product candidates at all, or it may agree to pay royalties to third parties or adopt a pricing model that reduces the amount of royalties we might otherwise expect. It is also possible that effective cell therapies will not be developed under the Genentech Agreement or, if developed, approved by the FDA or comparable regulatory authorities outside of the United States. Genentech may also terminate the Genentech Agreement at its convenience, at any time and without cause.

We may not be able to perform our product research, development and commercialization related obligations under the Genentech Agreement, including performing TCR screening activities for product

candidates being developed and commercialized under that agreement. For example, in the event a product is commercialized under the Genentech Agreement, as the volume of product sales grows, we will likely need to continue to increase our workflow capacity for sample intake, customer service and general process improvements, and expand our internal quality assurance program to support TCR screening on a larger scale within expected turnaround times. We will likely need additional certified laboratory scientists and other scientific and technical personnel for the Personalized Product to identify and target therapeutically relevant, patient-specific neoantigens. We will likely also need to acquire additional laboratory space and equipment, which can take several months or more to procure, set up and validate. These process enhancements and increases in scale, expansion of personnel, laboratory space and equipment may not be successfully implemented, and we may not have adequate space in our existing laboratory facilities to accommodate the required expansion. If we cannot satisfy our obligations, Genentech is entitled to trigger a technology transfer of our TCR screening process (specific to the Personalized Product) or terminate the Genentech Agreement. In addition, due to our significant obligations under the Genentech Agreement, we may face challenges in keeping existing customers, collaborators and suppliers and obtaining new customers, including any biopharmaceutical customers that are actual or potential competitors with Genentech.

If we support the commercialization of one or more products under the Genentech Agreement, we may need to incorporate new equipment, implement new technology systems and laboratory processes and hire new personnel with different qualifications. Failure to manage this growth or transition could result in turnaround time delays, higher product costs, declining product quality, deteriorating customer service and slower responses to competitive challenges. A failure in any one of these areas could make it difficult for us to meet market expectations for our products, and could damage our reputation and the prospects for our business, both under the Genentech Agreement and otherwise. As a result, our relationship with Genentech may not result in the realization of its anticipated benefits.

We have limited experience with the development and commercialization of cellular therapeutics, and future TCR-based cellular therapies may never be successfully developed and commercialized as part of our Genentech collaboration.

We have limited experience with the development of cellular therapeutics, and no experience with the commercialization, marketing and distribution of cellular therapeutics. Our therapeutic product candidates are at an early stage of discovery and development under our Genentech collaboration, and we are continuing to develop our TruTCR process being used under that collaboration to develop TCR-based cellular therapies for the treatment of cancer. Under our Genentech collaboration, Genentech has invested significant financial resources to develop future TCR-based cellular therapies, including conducting preclinical studies and other early research and development activities, and providing general and administrative support for these operations. Our future success is dependent on our and Genentech's ability to successfully develop therapeutic product candidates, and Genentech's ability, where applicable, to obtain regulatory and marketing approval for, and then successfully commercialize, cellular therapeutics. We and Genentech have not yet developed and commercialized any cellular therapeutics, and we may not be able to do so.

We currently use, and in the future expect to increase our use of, collaborators for several aspects of our operations, and if we cannot maintain current and enter new relationships with collaborators, our business will suffer.

We have limited resources to conduct our life sciences research, clinical diagnostics and drug discovery operations and have not yet fully established infrastructure for sales, marketing or distribution in connection with our products and services. Accordingly, we have entered into collaboration agreements under which our collaborators have provided, and may in the future provide,

funding and other resources for developing and potentially commercializing our products and services. In particular, we have entered into the Genentech Agreement, with the goal of accelerating the development and commercialization of T cell therapies for the treatment of a broad range of tumor types, and a strategic collaboration agreement with Microsoft ("Microsoft Agreement"), which provides us with access to Microsoft's research and machine learning technologies that we are using to develop our TCR-Antigen Map. These collaborations may result in our incurring significant expenses in pursuit of potential products and services, and we may not be successful in identifying, developing or commercializing any potential products or services.

Our future success depends in part on our ability to maintain these relationships and to establish new relationships. Many factors may impact the success of such collaborations, including our ability to perform our obligations, our collaborators' satisfaction with our products and services, our collaborators' performance of their obligations to us, our collaborators' internal priorities, resource allocation decisions and competitive opportunities, the ability to obtain regulatory approvals, disagreements with collaborators, the costs required of either party to the collaboration and related financing needs, and operating, legal and other risks in any relevant jurisdiction. In addition to reducing our revenue or delaying the development of our future products and services, the loss of one or more of these relationships may reduce our exposure to research, data, clinical trials or computing technologies that facilitate the collection and incorporation of new information into our clinical immunomics database. All of the risks relating to product and service development, regulatory clearance, authorization or approval and commercialization described in this prospectus apply to us derivatively through the activities of our collaborators.

We engage in conversations with companies regarding potential collaborations on an ongoing basis. These conversations may not result in a commercial agreement. Even if an agreement is reached, the resulting relationship may not be successful, and any products and services developed as part of the collaboration may not produce successful outcomes. Speculation in the industry about our existing or potential collaborations can be a catalyst for adverse speculation about us, or our products or services, which can adversely affect our reputation and our business.

Significant additional research and development and, in certain instances, clinical trials or validation will be required before we can potentially seek regulatory clearance, authorization or approval for, or commercialize any of our products or services in development.

We are developing a pipeline of immune-driven diagnostics and therapeutics, including immunoSEQ Dx and cellular therapies in oncology, but significant additional research and development activities and clinical trials or validations could be required before we and our collaborators will have a chance to achieve additional commercially viable products. Our research and development efforts remain subject to all of the risks associated with the development of new products and services based on immune-driven diagnostics and immune-mediated therapies. Development of the underlying technology may be affected by unanticipated technical or other problems, among other research and development issues, and the possible insufficiency of funds needed to complete development of these products and services. Safety, regulatory and efficacy issues, clinical hurdles or other challenges may result in delays and cause us to incur additional expenses that would increase our losses. If we and our collaborators cannot complete, or if we experience significant delays in developing, our clinical diagnostics or cellular therapies, particularly after incurring significant expenditures, our business may fail and investors may lose the entirety of their investment.

Prior to obtaining regulatory clearances, authorizations or approvals for the commercial sale of any new products or services, we must demonstrate that our products and services are both safe and effective for use in each target disease indication. Clinical studies may be necessary to demonstrate that a product or service is safe and effective. Clinical testing or validation is expensive and can take

many years to complete, and its outcome is inherently uncertain. Failure can occur at any time. For therapeutics, the results of preclinical studies and early clinical trials of products and services in development may not be predictive of the results of later-stage clinical trials, and initial success in clinical trials may not be indicative of results obtained when clinical trials are completed. There is typically an extremely high rate of failure as therapeutic products in development proceed through clinical trials. Products in later stages of clinical trials or validation also may fail to show the desired safety and efficacy profile despite having progressed through non-clinical studies and initial clinical trials or validations. Any delays in the development of our products and services may harm our business, financial condition and prospects significantly.

Errors or defects in our products or services could harm our reputation, decrease market acceptance of our products or services or expose us to product liability claims.

We are creating new products and services, many of which are initially based on largely untested technologies. As all of our products and services progress, we or others may determine that we made product or service level scientific or technological mistakes. The testing processes utilize a number of complex and sophisticated biochemical, informatics, optical and mechanical processes, many of which are highly sensitive to external factors. An operational or technology failure in one of these complex processes or fluctuations in external factors may result in less efficient processing or variation between testing runs. Refinements to our processes may initially result in unanticipated issues that reduce the efficiency or increase variability. In particular, sequencing, which is a key component of these processes, could be inefficient with higher than expected variability thereby increasing total sequencing costs and reducing the number of samples we can process in a given time period. Therefore, inefficient or variable processes can cause variability in our operating results and damage our reputation.

In addition, our laboratory operations could result in any number of errors or defects. Our quality assurance system may fail to prevent us from inadvertent problems with samples, sample quality, lab processes including sequencing, software, data upload or analysis, raw materials, reagent manufacturing, assay quality or design, or other components or processes. In addition, our assays may have quality or design errors, and we may have inadequate procedures or instrumentation to process samples, assemble our proprietary primer mixes and commercial materials, upload and analyze data, or otherwise conduct our laboratory operations. If we provide products or services with undiscovered errors to our customers, our clinical diagnostics may falsely indicate a patient has a disease or fail to detect disease in a patient who requires treatment. We believe our customers are likely to be particularly sensitive to product and service defects, errors and delays, including if our products and services fail to indicate the presence of residual disease with high accuracy from clinical specimens or if we fail to list or inaccurately indicate the presence or absence of disease in our test report. In drug discovery, such errors may interfere with our collaborators' clinical studies or result in adverse safety or efficacy profiles for their products in development. This may harm our customers' businesses and may cause us to incur significant costs, divert the attention of key personnel, encourage regulatory enforcement action against us, create a significant customer relations problem for us and cause our reputation to suffer. We may also be subject to warranty and liability claims for damages related to errors or defects in our products or services. Any of these developments could harm our business and operating results.

Our current and future products and services may never achieve significant commercial market acceptance.

Our success depends on the market's confidence that we can provide immune-driven research, diagnostic and therapeutic products and services that improve clinical outcomes, lower healthcare costs and enable better biopharmaceutical development. Failure of our products and services, or those jointly developed with our collaborators, to perform as expected could significantly impair our operating

results and our reputation. We believe patients, clinicians, academic institutions and biopharmaceutical companies are likely to be particularly sensitive to defects, errors, inaccuracies, delays and toxicities in or associated with our products and services. Furthermore, inadequate performance of these products or services may result in lower confidence in our immune medicine platform in general.

We and our collaborators may not succeed in achieving significant commercial market acceptance for our current or future products and services due to a number of factors, including:

- our ability to demonstrate the clinical utility of our immune medicine platform and related products and services and their potential advantages over existing life sciences research, clinical diagnostic and drug discovery technologies to academic institutions, biopharmaceutical companies and the medical community;
- our ability, and that of our collaborators, to secure and maintain FDA and other regulatory clearance, authorization or approval for our products;
- the agreement by third-party payors to reimburse our diagnostics, the scope and extent of which will affect patients' willingness or ability to pay for our diagnostics and will likely heavily influence physicians' decisions to recommend our tests;
- the rate of adoption of our immune medicine platform and related products and services by academic institutions, clinicians, key opinion leaders, advocacy groups and biopharmaceutical companies; and
- the impact of our investments in product innovation and commercial growth.

Additionally, our customers and collaborators may decide to decrease or discontinue their use of our products and services due to changes in their research and development plans, failures in their clinical trials, financial constraints, the regulatory environment, negative publicity about our products and services, competing products or the reimbursement landscape, all of which are circumstances outside of our control. We may not be successful in addressing these or other factors that might affect the market acceptance of our products and services and technologies. Failure to achieve widespread market acceptance of our immune medicine platform and related products and services would materially harm our business, financial condition and results of operations.

We rely on a limited number of suppliers or, in many cases, single suppliers, for laboratory equipment and materials and may not be able to find replacements or immediately transition to alternative suppliers.

We rely on a limited number of suppliers, or in many cases single suppliers, to provide certain sequencers and equipment that we use in our laboratory operations, as well as reagents and other laboratory materials for our products and services. An interruption in our laboratory operations, kit distribution or technology transfer could occur if we encounter delays, quality issues or other difficulties in securing these sequencers, equipment, reagents or other materials, and if we cannot then obtain an acceptable substitute. In addition, we would likely be required to incur significant costs and devote significant efforts to find new suppliers, acquire and qualify new equipment, validate new reagents and revalidate aspects of our existing assays, which may cause delays in our processing of samples or development and commercialization of products and services. Any such interruption could significantly affect our business, financial condition, results of operations and reputation.

In particular, we have purchased and rely on the Illumina NextSeq System. Illumina, Inc. ("Illumina") supplies us with reagents that have been designed for use solely with this sequencer and Illumina is the sole provider of maintenance and repair services for the Illumina NextSeq System. We also license our laboratory information management software from Illumina and receive services from

Illumina related to that software. We believe there are only a few other equipment manufacturers that are currently capable of supplying the equipment necessary for our laboratory operations, including sequencers and various associated reagents. The use of sequencers manufactured by a company other than Illumina would require us to alter our laboratory operations. Transitioning to and qualifying a new sequencer would be time-consuming and expensive, may result in interruptions in our laboratory operations, could affect the performance specifications of our laboratory operations or could require that we revalidate the reagents of our immunoSEQ kits, immunoSEQ Dx or clonoSEQ diagnostic testing services, and could require us to obtain additional clearance, authorization, approval, accreditation, or licensure for the changes. We may not be able to secure and implement alternative sequencers, associated reagents and other materials without experiencing interruptions in our workflow. In the case of an alternative supplier to Illumina, any replacement sequencers and various associated reagents may not be available or may not meet our quality control and performance requirements for our laboratory operations. If we should encounter delays or difficulties in securing, reconfiguring or revalidating the equipment and reagents we require for our products and services, our business, financial condition, results of operations and reputation could be adversely affected. In addition, Illumina is not obligated to meet all of our requirements for reagent supply. In the event Illumina ceases or slows its production of, or is otherwise unwilling or unable to continue to supply the sequencer regents necessary for and currently used in our business at or near current pricing, we may be required to purchase different reagents from Illumina or to purchase from a different reagent vendor under terms and conditions which could be less favorable to us. Any disruption in Illumina's operations or the suppliers of our reagents could impact our supply chain and laboratory operations of our immune medicine platform and our ability to conduct our business and generate revenue.

We have limited experience in marketing and selling products and services, and if we are unable to expand our direct sales and marketing force or partner with collaborators in certain product areas and markets to adequately address our customers' needs, our business may be adversely affected.

We have limited experience in marketing and selling our research and diagnostic products and services and no experience marketing and selling therapeutic products and services. Accordingly, we or our collaborators may not be able to market and sell our current or future products and services effectively enough to support our planned growth.

Our research and diagnostic sales and marketing efforts are targeted at a large and diverse market with highly specialized segments, including department heads, laboratory directors, principal investigators, core facility directors, clinicians, payors and research scientists and pathologists at leading academic institutions, biopharmaceutical companies, research institutions and contract research organizations. As a result, we believe it is necessary for our sales representatives to have relevant, specialized market experience. Our internal sales organization is currently small, and competition for experienced sales and marketing personnel is intense. We may not be able to attract and retain personnel or be able to build or adequately train an efficient and effective sales organization, which could negatively impact sales and market acceptance of our clinical diagnostics and limit our revenue growth and potential profitability. We are also seeking distribution partners, particularly for our improved immunoSEQ RUO kit by researchers who want to perform immunosequencing in their local labs. We may not be able engage a distribution partner on favorable terms, or at all.

We established a collaboration with Genentech for the research, development, marketing, promotion, distribution and sale of TCR-based cellular therapies for the treatment of cancer. Under the Genentech Agreement, Genentech has the sole right and authority to commercialize products developed under that agreement. It will be Genentech's responsibility to locate, qualify and engage distribution partners, clinicians and local hospitals with industry experience and knowledge to effectively market and sell products developed under that agreement. Genentech may not be able to

engage distribution partners, clinicians or hospitals on favorable terms, or at all. If Genentech's sales and marketing efforts with respect to products developed under the Genentech Agreement are not successful, we may not achieve significant market acceptance for our drug discovery services and platform, which would materially and adversely impact our business operations.

If we or our collaborators experience any of a number of possible unforeseen events in connection with clinical trials, our or their ability to conduct further clinical trials of, obtain regulatory clearance, authorization or approval of or commercialize future products and services or improvements to current products and services, could be delayed or prevented.

We or our collaborators may experience numerous unforeseen events during, or as a result of, clinical trials that could delay or prevent our or their ability to conduct further clinical trials or obtain regulatory clearance, authorization or approval of or commercialize future products and services or improvements to current products and services, including:

Evolving Regulatory Requirements and Policies

- the area of "precision medicine" or "personalized medicine" and its regulation may be subject to ongoing changes in terms of regulatory requirements and governmental policies, in ways we cannot predict;

Trial Design

- regulatory authorities or ethical review boards, including institutional review boards ("IRBs"), may not authorize commencement of a clinical trial or conduct a clinical trial at a prospective trial site;
- there may be delays in reaching or failure to reach agreement on acceptable clinical trial contracts or clinical trial protocols with prospective trial sites;
- the FDA or other regulatory authorities may disagree with a clinical trial design or a sponsor's interpretation of data and may change the requirements for product clearance, authorization or approval even after they have reviewed and commented on the clinical trial design;
- differences in trial design between early stage clinical trials and later-stage clinical trials may make it difficult to extrapolate the results of earlier clinical trials to later clinical trials;
- the FDA or other regulatory authorities may disagree about whether study endpoints are clinically meaningful;
- the number of patients, or amount of data, required for clinical trials, or improvements to current products, may be larger than anticipated, patient enrollment in these clinical trials may be slower than anticipated or patients may drop out of clinical trials at a higher rate than anticipated;

Testing

- changes may be made to product candidates after commencing clinical trials, which may require that previously completed stages of clinical testing be repeated or delay later stages of testing, for example, we, or our collaborators, may pursue one or more different product development pathways for our T cell immunotherapies;
- clinical trials may fail to satisfy the applicable regulatory requirements of the FDA or other regulatory authorities responsible for oversight of the conduct of clinical trials in other countries;

- regulators may elect to impose a clinical hold, or governing IRBs, data safety monitoring board or ethics committees may elect to suspend or terminate our clinical research or trials for various reasons, including non-compliance with regulatory requirements or a finding that the participants are being exposed to unacceptable risks to their health or the privacy of their health information being disclosed;
- the cost of clinical trials of future products and services, or improvements to current products and services, may be greater than we anticipate;
- we may not have sufficient capacity in our laboratories to perform testing as requested or volumes requested or with the requested turnaround times necessary for clinical trials;
- the supply or quality of materials or data necessary to conduct clinical trials of future products and services, or improvements to current products and services, may be insufficient or inadequate;

Trial Outcomes

- the outcome of our collaborators' preclinical studies and early clinical trials may not be predictive of the success of later clinical trials, and interim results of a clinical trial do not necessarily predict final results;
- product candidates may be associated with negative or inconclusive results in clinical trials, and we or our collaborators may decide to deprioritize or abandon these product candidates, or regulatory authorities may require us to abandon them or impose onerous changes or requirements, which could lead to deprioritization or abandonment;
- product candidates may have undesirable side effects which could lead to serious adverse events, or other unexpected characteristics. One or more of such effects or events could cause regulators to impose a clinical hold on the applicable trial, or cause us, our collaborators or their investigators, IRBs or ethics committees to suspend or terminate the trial of that product candidates;
- clinical trials may suggest or demonstrate that products or services are not as efficacious or safe as other similar diagnostics or therapies; and
- preclinical and clinical data are often susceptible to varying interpretations and analyses, and our products and services in development may fail to obtain regulatory clearance, authorization or approval, even if they perform satisfactorily in preclinical studies and clinical trials.

Delays of this nature could also allow competitors to bring products to market before we or our collaborators do, potentially impairing our ability to successfully commercialize our products and services in development and harming our business and results of operations. Any delays in the development of our products and services or those jointly developed with our collaborators may significantly harm our business, financial condition and prospects. Many of the factors that cause, or lead to, a delay in the commencement or completion of clinical trials may also ultimately lead to the denial of regulatory clearance, authorization or approval of products and services in development.

We will need to develop and expand our workforce, commercial infrastructure and laboratory operations to support anticipated growth in demand for our products and services, and we may encounter difficulties in managing this development and expansion and in meeting fluctuations in this demand.

We will need to expand our workforce, commercial infrastructure and laboratory operations to support anticipated growth in demand for our products and services. If we are unable to support

fluctuations in the demand for our products and services, including ensuring that we have adequate capacity to meet increased demand, our business could suffer. As of March 31, 2019, we had 346 full-time employees and we expect to increase the number of employees and the scope of our operations as we continue to develop our clinical diagnostic products and services. As we and our collaborators commercialize additional products and services, we may need to incorporate new equipment, implement new technology systems and laboratory processes and hire new personnel with different qualifications. For example, in connection with our Genentech collaboration, we may need to procure additional laboratory space and personnel to allow us to increase TCR screening times with respect to product candidates being developed under the Genentech Agreement. Failure to manage this growth or transition could result in turnaround time delays, higher service costs, declining service quality, deteriorating customer service and slower responses to competitive challenges. A failure in any one of these areas could make it difficult for us to meet market expectations for our products and services, and could damage our reputation and the prospects for our business.

To manage our anticipated expansion, we must continue to implement and improve our managerial, operational and financial systems, expand our facilities and continue to recruit and train additional qualified personnel. Also, our management team may need to divert a disproportionate amount of its attention away from its day-to-day activities and devote a substantial amount of time to managing these development activities. Due to our limited resources and early stage of growth, we may not be able to effectively manage this simultaneous execution and the expansion of our operations or recruit and train additional qualified personnel. This may result in weaknesses in our infrastructure, operational mistakes, slower development of our products and services, missed or delayed milestone achievement, loss of business opportunities, loss of employees and reduced productivity among remaining employees.

If our management is unable to effectively manage our expected development and expansion, our expenses may increase more than expected, our ability to generate or increase our revenue could be reduced and we may not be able to implement our business strategy. Our future financial performance, and our ability to develop and commercialize our products and services and compete effectively, will depend, in part, on our ability to effectively manage our future development and expansion.

Our operating results may fluctuate significantly, which makes our future operating results difficult to predict and could cause our operating results to fall below expectations or any guidance we may provide.

Our financial condition and operating results have varied in the past and will continue to fluctuate from quarter-to-quarter and year-to-year in the future due to a variety of factors, many of which are beyond our control. Factors relating to our business that may contribute to these fluctuations include the following, as well as other factors described elsewhere in this prospectus:

- the timing of upfront payments from our collaborators;
- our ability and that of our collaborators to develop and successfully commercialize our products and services;
- our ability to achieve collaboration-based milestones on currently contemplated timelines, or at all;
- availability and extent of reimbursement by governmental and private payors for our products and services;
- the ability of our clinical sales teams to convert physicians from using incumbent products in the market to clonoSEQ and new diagnostic products and services we may develop;

- our ability to drive repeat usage of the clonoSEQ diagnostic test by physicians and get reimbursed for that repeat usage by commercial and government payors for monitoring of MRD;
- the outcomes of research initiatives, clinical trials or other product development or approval processes conducted by us or our collaborators;
- the level of demand for our products and services, which may vary significantly;
- our relationships, and any associated exclusivity terms, with collaborators;
- our ability to manage our growth;
- our contractual or other obligations to provide resources to fund our products and services and to provide resources to our collaborations;
- delays or failures in advancement of future products in clinical trials by us or our collaborators;
- risks associated with the future international expansion of our business, including the potential to conduct clinical trials and commercialize our products and services in multiple international locations;
- our ability and that of our collaborators to consistently manufacture our products;
- our dependence on, and the need to attract and retain, key management and other personnel;
- our ability to obtain, protect and enforce our intellectual property rights;
- our ability to prevent the theft or misappropriation of our intellectual property, know-how or technologies;
- our ability to obtain additional capital that may be necessary to expand our business;
- our ability to accurately report our financial results in a timely manner;
- business interruptions such as power outages, strikes, acts of terrorism or natural disasters; and
- our ability to use our net operating loss (“NOL”) carryforwards to offset future taxable income.

The cumulative effects of factors discussed above could result in large fluctuations and unpredictability in our quarterly and annual operating results. As a result, comparing our operating results on a period-to-period basis may not be meaningful. Investors should not rely on our past results as an indication of our future performance. In any particular period, our operating results could be below the expectations of securities analysts or investors, which could cause our stock price to decline.

While as a general matter we intend to periodically report on the status of our development initiatives, including anticipated next steps, we may not provide forward-looking guidance on the timing of those next steps. In addition, we do not control the timing of disclosure of any such milestones related to any of our products and services that are managed by our collaborators. Any disclosure by us or our collaborators of data that is perceived as negative may have a material adverse impact on our stock price or overall valuation. Our stock price may decline as a result of unexpected clinical trial results in one or more of our products and services, including adverse safety events reported for any of our products or services.

We have estimated the sizes of the markets for our current and future products and services, and these markets may be smaller than we estimate.

Our estimates of the annual addressable markets for our current products and services and those under development are based on a number of internal and third-party estimates, including, without

limitation, the number of patients who have developed one or more of a broad range of cancers, the number of individuals who are at a higher risk for developing one or more of a broad range of cancers, the number of individuals who have developed or are at a higher risk of developing certain autoimmune disorders, the number of individuals with certain infectious diseases we or our collaborators are able to treat through our products and services, the number of potential tests utilized per treatment course per patient and the assumed prices at which we can sell our current and future products and services for markets that have not been established. While we believe our assumptions and the data underlying our estimates are reasonable, these assumptions and estimates may not be correct and the conditions supporting our assumptions or estimates may change at any time, thereby reducing the predictive accuracy of these underlying factors. As a result, our estimates of the annual addressable market for our current or future products and services may prove to be incorrect. If the actual number of patients who would benefit from our products or services, the price at which we can sell future products and services or the annual addressable market for our products or services is smaller than we have estimated, it may impair our sales growth and have an adverse impact on our business.

If we do not compete effectively with scientific and commercial competitors, we may not be able to successfully commercialize our products and services.

The biotechnology and pharmaceutical industries, including the fields of life sciences research, clinical diagnostics and drug discovery are intense and highly competitive. These fields are characterized by rapidly advancing technologies and a strong emphasis on intellectual property. Given the breadth and promise of immune medicine, we face substantial competition from many different sources, including life sciences tools, diagnostics, pharmaceutical and biotechnology companies, academic research institutions and governmental agencies and public and private research institutions across various components of our platform and product and service offerings. Due to the significant interest and growth in immune-driven medicine more broadly, we expect the intensity of the competition to increase.

Specifically, in life sciences research, our immunoSEQ research services face competition from a number of companies, including, among others, Thermo Fisher Scientific Inc., ArcherDX, Inc., 10X Genomics, Inc., Invivoscribe, Inc., iRepertoire, Inc., QIAGEN N.V., Takara Bio Inc., Fluidigm Corporation and Dolomite Bio (a brand of Blacktrace Holdings Ltd).

In clinical diagnostics, our clonoSEQ diagnostic test faces competition primarily from institutions performing flow cytometry in-house, particularly outside of the United States. Competitors with diagnostic technology platforms include Invivoscribe, Inc., ArcherDX, Inc. and Becton, Dickinson and Company. We may also face competition from companies developing early cancer detection testing products for indications that do not currently compete with clonoSEQ, including GRAIL, Inc., Guardant Health, Inc., Exact Sciences Corporation and Natera, Inc.

In drug discovery, clinical trials of immune-driven medicines are being undertaken by a number of industry and academic players. Direct competitors with a pipeline of preclinical and clinical TCR-based cellular therapy candidates include GlaxoSmithKline plc, Adaptimmune Therapeutics plc, Kite Pharma, Inc./Gilead Sciences, Inc., Juno Therapeutics, Inc./Celgene Corporation, bluebird bio, Inc., Immatics Biotechnologies GmbH, Neon Therapeutics, Inc. and several others.

Our competitors may have or will obtain the knowledge necessary to generate and characterize similar data to our known data for the purpose of identifying and developing products or services that could compete with any of our products or services. Further, immune medicine is being pursued by several biotechnology companies as well as by large-cap biopharmaceutical companies. Many of our current or potential competitors, either alone or with their collaboration partners, have significantly greater financial resources and expertise in research and development, manufacturing, regulatory approval and compliance, and sales and distribution than we do.

We could be adversely affected if we do not develop our life sciences research, clinical diagnostic and drug discovery products and services, obtain required regulatory and other clearances, authorizations or approvals, obtain or enforce patents covering our discoveries and launch our products and services before our competitors. Moreover, our competitors may succeed in developing immunosequencing-based life sciences research, clinical diagnostics and drug discoveries that circumvent our technologies, products or services. Our competitors may succeed in developing and commercializing research or diagnostic products or services that are more accurate, more convenient to use or more cost-effective than our products or services or therapeutic products that prove to be more safe, more effective, more convenient to administer or more cost-effective than any therapeutic products we may develop with our collaborators or that would render our technologies, products and services less competitive or obsolete. We expect competition to intensify in the fields in which we are involved as technical advances in these fields occur and become more widely known. For additional information regarding our competition, see the "*Business—Competition*" section of this prospectus.

The life sciences industry is subject to rapid change, which could make our immune medicine platform and related products and services that we develop obsolete.

Our industry is characterized by rapid changes, including technological and scientific breakthroughs, frequent new product and service introductions and enhancements and evolving industry standards, all of which could make our current and future products and services obsolete. Our future success will depend on our ability to keep pace with the evolving needs of our customers on a timely and cost-effective basis and to pursue new market opportunities that develop as a result of scientific and technological advances. In recent years, there have been numerous advances in technologies relating to life sciences research and the diagnosis and treatment of cancer, other diseases and autoimmune disorders. There have also been advances in technologies used to computationally analyze very large amounts of biologic information. If we do not update our products and services to reflect new scientific knowledge about immunosequencing, immunology, computational biology, software development, new disease diagnostics and therapies or the diseases we seek to treat, our products and services could become obsolete and sales of our current products and services and any future products and services we develop based on our immune medicine platform could decline or fail to grow as expected.

The loss of any member of our senior management team or our inability to attract and retain highly skilled scientists, clinicians and salespeople could adversely affect our business.

Our success depends on the skills, experience and performance of key members of our senior management team, including Chad Robins, our Chief Executive Officer and Co-Founder, Dr. Harlan Robins, our Chief Scientific Officer and Co-Founder, and Julie Rubinstein, our President. The individual and collective efforts of these employees will be important as we continue to develop products and services based on our immune medicine platform. The loss or incapacity of existing members of our executive management team could adversely affect our operations if we experience difficulties in hiring qualified successors. Our executive officers have signed employment agreements with us, but their service is at-will and may end at any point in time.

Our research and development initiatives and laboratory operations depend on our ability to attract and retain highly skilled scientists, technicians and software engineers. We may not be able to attract or retain qualified scientists, technicians or software engineers in the future due to the competition for qualified personnel among life science and technology businesses, particularly near our headquarters located in Seattle, Washington and our laboratory facilities located in South San Francisco, California. We also face competition from universities and public and private research institutions in recruiting and retaining highly qualified scientific personnel. We may have difficulties locating, recruiting or retaining qualified sales people. Recruiting, training and retention difficulties can

limit our ability to support our research and development and commercialization efforts. All of our employees are at-will, which means that either we or the employee may terminate their employment at any time.

In addition, we rely on consultants, contractors and advisors, including scientific and clinical advisors, to assist us in formulating our research and development, regulatory and commercialization strategy. Our consultants and advisors may provide services to other organizations and may have commitments under consulting or advisory contracts with other entities that may limit their availability to us. The loss of the services of one or more of our current consultants or advisors might impede the achievement of our research, development, regulatory and commercialization objectives. In addition, we have flexibly grown our workforce through the use of contractors and part time workers. We may not be able to retain the services of such personnel which might result in delays in the operation of our business.

If we lose the support of key thought leaders, it may be difficult to establish products and services enabled by our immune medicine platform as industry standards, which may limit our revenue growth and ability to achieve profitability.

We have established relationships with leading oncology, hematology, immunology, autoimmunity or inflammatory disease, transplantation and solid tumor thought leaders at premier academic and research institutions. If these key thought leaders determine that our immune medicine platform or our current or future products or services are not clinically effective, determine that alternative technologies are more effective or elect to use internally developed services, we could encounter significant difficulty validating our products or services, driving adoption or establishing our immune medicine platform as an industry standard, which would limit our revenue growth and our ability to achieve profitability. In addition, negative publications or reviews by clinicians, industry groups or other important stakeholders may negatively impact our revenue growth and ability to achieve profitability.

We depend on our information technology systems and any failure of these systems could harm our business.

We depend on information technology and telecommunications systems, including third-party cloud computing infrastructure, operating systems and artificial intelligence platforms, for significant elements of our operations, including our laboratory information management system, clinical immunomics database, immunoSEQ Analyzer, TCR-Antigen Map, laboratory workflow tools, customer and collaborator reporting and related functions. We also depend on our proprietary workflow software to support new product and service launches and regulatory compliance.

We use complex software processes and pipelines to manage samples and evaluate sequencing result data. These are subject to initial design or ongoing modifications which may result in unanticipated issues that could cause variability in patient results, leading to service disruptions or errors, resulting in liability.

We have installed, and expect to expand, a number of enterprise software systems that affect a broad range of business processes and functional areas, including systems handling human resources, financial controls and reporting, contract management, regulatory compliance and other infrastructure operations. In addition to these business systems, we have installed, and intend to extend, the capabilities of both our preventative and detective security controls by augmenting the monitoring and alerting functions, the network design and the automatic countermeasure operations of our technical systems. These information technology and telecommunications systems support a variety of functions, including laboratory operations, test validation, sample tracking, quality control, customer service support, billing and reimbursement, research and development activities, scientific

and medical curation and general administrative activities. In addition, our third-party billing and collections provider depends upon technology and telecommunications systems provided by outside vendors.

Information technology and telecommunications systems are vulnerable to damage from a variety of sources, including telecommunications or network failures, malicious human acts and natural disasters. Moreover, despite network security and back-up measures, some of our servers are potentially vulnerable to physical or electronic break-ins, computer viruses and similar disruptive problems. Despite the precautionary measures we have taken to prevent unanticipated problems that could affect our information technology and telecommunications systems, failures or significant downtime of these systems or those used by our collaborators or subcontractors could prevent us from conducting our comprehensive immunosequencing analysis, clinical diagnostics and drug discovery, preparing and providing reports to researchers, clinicians and our collaborators, billing payors, handling physician inquiries, conducting research and development activities and managing the administrative aspects of our business. Any disruption or loss of information technology or telecommunications systems on which critical aspects of our operations depend could have an adverse effect on our business and our reputation, and we may be unable to regain or repair our reputation in the future.

International expansion of our business exposes us to business, regulatory, political, operational, financial and economic risks associated with doing business outside of the United States.

Because we and our collaborators currently market our products and services outside of the United States and may market future products and services outside of the United States, if cleared, authorized or approved, our business is subject to risks associated with doing business outside of the United States, including an increase in our expenses and diversion of our management's attention from the development of future products and services. Accordingly, our business and financial results in the future could be adversely affected due to a variety of factors, including:

- multiple, conflicting and changing laws and regulations such as privacy security and data use regulations, tax laws, export and import restrictions, economic sanctions and embargoes, employment laws, anticorruption laws, regulatory requirements, reimbursement or payor regimes and other governmental approvals, permits and licenses;
- failure by us, our collaborators or our distributors to obtain regulatory clearance, authorization or approval for the use of our products and services in various countries;
- additional potentially relevant third-party patent rights;
- complexities and difficulties in obtaining intellectual property protection and enforcing our intellectual property;
- difficulties in staffing and managing foreign operations;
- complexities associated with managing multiple payor reimbursement regimes, government payors or patient self-pay systems;
- difficulties in negotiating favorable reimbursement negotiations with governmental authorities;
- logistics and regulations associated with shipping samples, including infrastructure conditions and transportation delays;
- limits in our ability to penetrate international markets if we are not able to conduct our immunosequencing or clinical diagnostic services locally;

- financial risks, such as longer payment cycles, difficulty collecting accounts receivable, the impact of local and regional financial crises on demand and payment for our products and services and exposure to foreign currency exchange rate fluctuations;
- natural disasters, political and economic instability, including wars, terrorism and political unrest, outbreak of disease, boycotts, curtailment of trade and other business restrictions;
- regulatory and compliance risks that relate to maintaining accurate information and control over sales and distributors' activities that may fall within the purview of the U.S. Foreign Corrupt Practices Act ("FCPA"), its books and records provisions, or its anti-bribery provisions, or laws similar to the FCPA in other jurisdictions in which we may now or in the future operate, such as the United Kingdom's Bribery Act of 2010; and
- onerous anti-bribery requirements of several member states in the European Union ("EU"), such as the United Kingdom's Bribery Act of 2010, and other countries that are constantly changing and require disclosure of information to which U.S. legal privilege may not extend.

Any of these factors could significantly harm our future international expansion and operations and, consequently, our revenue and results of operations.

We may never obtain approval in the EU or in any other foreign country for any of our products or services and, even if we do, we or our collaborators may never be able to commercialize them in any other jurisdiction, which would limit our ability to realize their full market potential.

In order to eventually market any of our current or future products and services in any particular foreign jurisdiction, we must establish and comply with numerous and varying regulatory requirements on a jurisdiction-by-jurisdiction basis regarding quality, safety, performance and efficacy. In addition, clinical trials or clinical investigations conducted in one country may not be accepted by regulatory authorities in other countries, and regulatory clearance, authorization or approval in one country does not guarantee regulatory clearance, authorization or approval in any other country. Approval processes vary among countries and can involve additional product testing and validation and additional administrative review periods.

Seeking foreign regulatory clearance, authorization or approval could result in difficulties and costs for us and our collaborators and require additional preclinical studies, clinical trials or clinical investigations which could be costly and time-consuming. Regulatory requirements and ethical approval obligations can vary widely from country to country and could delay or prevent the introduction of our products and services in those countries. The foreign regulatory clearance, authorization or approval process involves all of the risks and uncertainties associated with FDA clearance, authorization or approval. We currently sell our RUO kits outside of the United States and have completed a technology transfer process for research use to a site in Toulouse, France, but have no experience in obtaining regulatory clearance, authorization or approval in international markets. If we or our collaborators fail to comply with regulatory requirements in international markets or to obtain and maintain required regulatory clearances, authorizations or approvals in international markets, or if those approvals are delayed, our target market will be reduced and our ability to realize the full market potential of our products and services will be unrealized.

If our laboratory facilities become damaged or inoperable or we are required to vacate our existing facilities, our ability to conduct our laboratory processes and analysis and pursue our research and development efforts may be jeopardized.

We operate laboratory facilities located in Seattle, Washington and South San Francisco, California. Our facilities and equipment could be harmed or rendered inoperable by natural or

man-made disasters, including war, fire, earthquake, power loss, communications failure or terrorism, which may render it difficult or impossible for us to operate our immune medicine platform for some period of time. The inability to perform our laboratory processes or to reduce the backlog of analysis that could develop if our facilities are inoperable, for even a short period of time, may result in the loss of customers or harm to our reputation, and we may be unable to regain those customers or repair our reputation in the future. Furthermore, our facilities and the equipment we use to perform our research and development work could be unavailable or costly and time-consuming to repair or replace. It would be difficult, time-consuming and expensive to rebuild our facilities, to locate and qualify new facilities or license or transfer our proprietary technologies to a third party, particularly in light of licensure and accreditation requirements. Even in the unlikely event we are able to find a third party with such qualifications to enable us to conduct our laboratory processes, we may be unable to negotiate commercially reasonable terms.

We carry insurance for damage to our property and the disruption of our business, but this insurance may not cover all of the risks associated with damage or disruption to our business, may not provide coverage in amounts sufficient to cover our potential losses and may not continue to be available to us on acceptable terms, if at all.

We may need to raise additional capital to fund our existing operations, develop additional products and services, commercialize new products and services or expand our operations.

Based on our current business plan, we believe the net proceeds from this offering, together with our current cash, cash equivalents and marketable securities and anticipated cash flow from operations, will be sufficient to meet our anticipated cash requirements over at least the next 12 months from the date of this prospectus. If our available cash and investment balances, net proceeds from this offering and anticipated cash flow from operations are insufficient to satisfy our liquidity requirements, including because of lower demand for our products and services as a result of risks described in this prospectus, we may seek to sell common or preferred equity or convertible debt securities, enter into a credit facility or another form of third-party funding or seek other debt financing.

We may consider raising additional capital in the future to expand our business, to pursue strategic investments, to take advantage of financing opportunities or for other reasons, including to:

- increase our sales and marketing efforts to drive market adoption of our life sciences research, clinical diagnostics and therapeutics;
- fund development efforts for our current and future products and services;
- expand our products and services into other disease indications and clinical applications;
- acquire, license or invest in technologies;
- acquire or invest in complementary businesses or assets; and
- finance capital expenditures and general and administrative expenses.

Our present and future funding requirements will depend on many factors, including:

- our ability to achieve revenue growth;
- our rate of progress in establishing payor coverage and reimbursement arrangements with domestic and international commercial third-party payors and government payors;
- the cost of expanding our laboratory operations and offerings, including our sales and marketing efforts;
- our rate of progress in, and cost of the sales and marketing activities associated with, establishing adoption of our immunoSEQ research services and kits, and reimbursement for

our clonoSEQ diagnostic test, our immunoSEQ Dx early detection test and cellular therapies developed under the Genentech Agreement;

- our rate of progress in, and cost of research and development activities associated with, products and services in research and early development;
- the effect of competing technological, product and market developments;
- costs related to international expansion; and
- the potential cost of and delays in product development as a result of any regulatory oversight applicable to our products and services.

The various ways we could raise additional capital carry potential risks. If we raise funds by issuing equity securities, dilution to our shareholders could result. Any preferred equity securities issued also could provide for rights, preferences or privileges senior to those of holders of our common stock. If we raise funds by issuing debt securities, those debt securities would have rights, preferences and privileges senior to those of holders of our common stock. The terms of debt securities issued or borrowings pursuant to a credit agreement could impose significant restrictions on our operations. If we raise funds through collaborations and licensing arrangements, we might be required to relinquish significant rights to our platform technologies or products and services or grant licenses on terms that are not favorable to us.

Our ability to use our NOL carryforwards and certain other tax attributes may be limited.

We have incurred net losses since our inception and we may never achieve or sustain profitability. Generally, losses incurred will carry forward until such losses expire (for losses generated prior to January 1, 2018) or are used to offset future taxable income, if any. Under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended (“Code”), if a corporation undergoes an “ownership change,” generally defined as a greater than 50 percentage point change in its equity ownership by certain shareholders over a three-year period, the corporation’s ability to use its pre-ownership change NOL carryforwards and other pre-ownership change tax attributes, such as research tax credits, to offset its post-ownership change income or taxes may be limited. Under the December 2017 Tax Cuts and Jobs Act (“TCJA”), which significantly reformed U.S. tax law, federal NOLs incurred in 2018 and in future years may be carried forward indefinitely, but the deductibility of such federal NOLs is limited to 80% of annual taxable income. It is uncertain if and to what extent various states will conform to the TCJA. If there should be an ownership change, our ability to utilize our NOL carryforwards and credits could be limited. We have completed a study of our ownership changes and related tax losses, and believe $186.9 million of losses are not subject to permanent limitation with the exception of losses incurred by Sequenta which need to be assessed for ownership changes under Sections 382 and 383. The approximate value of those losses subject to potential limitation is $38.5 million. We may experience ownership changes in the future as a result of shifts in our stock ownership, which may be outside of our control, including in connection with this offering. As a result, if we earn net taxable income, our ability to use our pre-ownership change NOL carryforwards to offset such taxable income will be subject to limitations. Similar provisions of state tax law may also apply to limit our use of accumulated state tax attributes. As a result, even if we attain profitability, we may be unable to use a material portion of our NOL carryforwards and other tax attributes, which could adversely affect our future cash flows.

In addition, the TCJA reduced the corporate tax rate from a top marginal tax rate of 35% to a flat rate of 21%, limited the tax deduction for net business interest expense to 30% of adjusted taxable income, eliminated NOL carrybacks and modified or repealed many business deductions and credits, including reducing the business tax credit for certain clinical testing expenses incurred in the testing of

certain drugs for rare diseases or conditions generally referred to as “orphan drugs.” The U.S. Department of the Treasury and the U.S. Internal Revenue Service (“IRS”) have already issued and are expected to continue to provide guidance on the implementation of the TCJA. We continue to examine the impact this tax reform legislation may have on our business and the operations of our collaborators. However, the effect of the TCJA on our business and the operations of our collaborators, whether adverse or favorable, is uncertain and may not become evident for some period of time. We urge investors to consult with their legal and tax advisors regarding the implications of the TCJA on an investment in our common stock.

We could be adversely affected by violations of the FCPA and other worldwide anti-bribery laws.

As we expand geographically, commercialize our products and services, and attempt to obtain required clearances, authorizations or approvals required to offer products and services for sale, we or our collaborators may be deemed to do business outside the United States, including because international customers may be able to order our products and services. As a result, we or our collaborators would be subject to the FCPA, which prohibits companies and their intermediaries from making payments in violation of law to non-U.S. government officials for the purpose of obtaining or retaining business or securing any other improper advantage. In addition, our collaborators or any third-party distributors could be deemed to be our agents and we could be held responsible for their actions, including violations of the FCPA. Other U.S. companies in the life sciences industry have faced criminal penalties under the FCPA for allowing their agents to deviate from appropriate practices in doing business with non-U.S. government officials. We may also become subject to similar anti-bribery laws in the jurisdictions in which we may operate, including the United Kingdom’s Bribery Act of 2010, which also prohibits commercial bribery and makes it a crime for companies to fail to prevent bribery. These laws are complex and far-reaching in nature, and we may be required in the future to alter one or more of our practices to be in compliance with these laws. Accordingly, our expansion internationally will demand a high degree of vigilance, and any violations of these laws, or allegations of such violations, could disrupt our operations, involve significant management distraction, involve significant costs and expenses, including legal fees, and could result in a material adverse effect on our business, prospects, financial condition or results of operations. We could also suffer severe penalties, including criminal and civil penalties, disgorgement and other remedial measures.

We may acquire other businesses or form joint ventures or make investments in other companies or technologies that could negatively affect our operating results, dilute our shareholders’ ownership, increase our debt or cause us to incur significant expense.

We may pursue acquisitions of businesses and assets. We also may pursue joint ventures or investments that leverage our immune medicine platform and industry experience to expand our offerings or distribution. We have no experience forming joint ventures and little experience investing in or acquiring other companies. We may not be able to find suitable joint ventures, investment or acquisition candidates, and we may not be able to complete such transactions on favorable terms, if at all. If we make any acquisitions, we may not be able to integrate the acquired company successfully into our existing business, and we could assume unknown or contingent liabilities, including regulatory violations such as the FCPA or similar laws. Any future acquisitions also could result in the incurrence of debt, contingent liabilities or future write-offs of intangible assets or goodwill, any of which could have a material adverse effect on our financial condition, results of operations and cash flows. Integration of an acquired company also may disrupt ongoing operations and require management resources that we would otherwise focus on developing our existing business. We may experience losses related to investments in other companies, which could have a material negative effect on our results of operations and financial condition. We may not realize the anticipated benefits of any acquisition, technology license, collaboration or joint venture.

To finance any acquisitions or joint ventures, we may choose to issue shares of our common stock as consideration, which would dilute the ownership of our shareholders. Additional funds may not be available on terms that are favorable to us, or at all. If the price of our common stock is low or volatile, we may not be able to acquire other companies or fund a joint venture project using our stock as consideration.

Unfavorable U.S. or global economic conditions could adversely affect our business, financial condition or results of operations.

Our results of operations could be adversely affected by general conditions in the global economy and financial markets. The most recent global financial crisis caused extreme volatility and disruptions in the capital and credit markets. A severe or prolonged economic downturn could result in a variety of risks to our business, including weakened demand for our products and services and our ability to raise additional capital when needed on favorable terms, if at all. A weak or declining economy could strain our collaborators, possibly resulting in supply disruption, or cause delays in their payments to us. Any of the foregoing could harm our business and we cannot anticipate all of the ways in which the current economic climate and financial market conditions could adversely impact our business.

We use biological and hazardous materials that require considerable expertise and expense for handling, storage and disposal and may result in claims against us.

We work with materials, including chemicals, biological agents and compounds and samples that could be hazardous to human health and safety or the environment. Our operations also produce hazardous and biological waste products. Federal, state and local laws and regulations govern the use, generation, manufacture, storage, handling and disposal of these materials and wastes. Compliance with applicable environmental laws and regulations is expensive, and current or future environmental laws and regulations may restrict our operations. If we do not comply with applicable regulations, we may be subject to fines and penalties.

In addition, we cannot eliminate the risk of accidental injury or contamination from these materials or wastes, which could cause an interruption of our commercialization efforts, research and development programs, and business operations, as well as environmental damage resulting in costly cleanup and liabilities under applicable laws and regulations. Furthermore, environmental laws and regulations are complex, change frequently and have tended to become more stringent. We cannot predict the impact of such changes and cannot be certain of our future compliance. While our property insurance policy provides limited coverage in the event of contamination from hazardous and biological products and the resulting cleanup costs, we do not currently have any additional insurance coverage for legal liability for claims arising from the handling, storage or disposal of hazardous materials. Accordingly, in the event of contamination or injury, we could be liable for damages or penalized with fines in an amount exceeding our resources and our operations could be suspended or otherwise adversely affected.

If we were to be sued for product liability or professional liability, we could face substantial liabilities that exceed our resources.

The marketing, sale and use of our products and services could lead to the filing of product or professional liability claims were someone to allege that our products or services identified inaccurate, incomplete or untimely information regarding the sequence or antigen specificities of TCRs, BCRs or antigens analyzed or the clonality characterized, or MRD or malignancy detected, or that our products or services otherwise failed to perform as designed or intended. We could also be potentially exposed to claims relating to therapeutic failures of products commercialized under our collaborations, such as

a cellular therapy marketed by Genentech that is manufactured based on TCR-related sequences and data we provide. We may also be subject to liability for errors in, a misunderstanding of or inappropriate reliance upon, the information we provide in the ordinary course of our business activities. A product liability or professional liability claim could result in substantial damages and be costly and time-consuming for us to defend. Regardless of merit or eventual outcome, product liability and professional liability claims may result in:

- decreased demand for any products, services or clinical solutions that we have developed or may develop;
- loss of revenue;
- substantial monetary awards to patients or their families;
- significant time and costs to defend related litigation;
- withdrawal of clinical trial participants;
- the inability to commercialize any products, services or clinical solutions that we have developed or may develop; and
- injury to our reputation and significant negative media attention.

We maintain product and professional liability insurance, but this insurance may not fully protect us from the financial impact of defending against product liability or professional liability claims. Any product liability or professional liability claim brought against us, with or without merit, could increase our insurance rates or prevent us from securing insurance coverage in the future. Additionally, any product liability lawsuit could cause current collaborators to terminate existing agreements or potential collaborators to seek other companies, any of which could impact our results of operations.

We or our collaborators may be adversely affected by natural or man-made disasters or other business interruptions, such as cybersecurity attacks, and our business continuity and disaster recovery plans, or those of our collaborators, may not adequately protect us from the effects of a serious disaster.

Natural and man-made disasters and other events beyond our control could severely disrupt our operations, or those of our collaborators, and have a material adverse impact on our business, results of operations, financial condition and prospects. If a natural disaster, power outage, cybersecurity attack or other event occurred that prevented us from using all or a significant portion of our headquarters, damaged critical infrastructure, such as our laboratory facilities or those of our collaborators, limited our or our collaborators' ability to access or use our respective digital information systems or that otherwise disrupted our respective operations, it may be difficult or, in certain cases, impossible for us or our collaborators to continue our respective businesses for a substantial period of time. The disaster recovery and business continuity plans we and our collaborators currently have in place are limited and are unlikely to prove adequate in the event of a serious disaster or similar event. Our cybersecurity liability insurance may not cover any or all damages, depending on the severity and extent, we or our collaborators could sustain based on any breach of our respective computer security protocols or other cybersecurity attack. We may incur substantial expenses as a result of the limited nature of our respective disaster recovery and business continuity plans, which could have a material adverse impact on our business.

Risks Relating to Government Regulation

We conduct our business in a heavily regulated industry, and changes in regulations or violations of regulations may, directly or indirectly, reduce our revenue, adversely affect our results of operations and financial condition and harm our business.

The life sciences industry is highly regulated, and the regulatory environment in which we and our collaborators operate may change significantly and adversely to us in the future. Areas of the regulatory environment that may affect our ability to conduct business include, without limitation, federal and state laws relating to:

- laboratory testing, including the federal Clinical Laboratory Improvement Amendments of 1988 ("CLIA") and state laboratory licensing laws;
- the development, testing, use, distribution, promotion and advertising of research services, kits, clinical diagnostics and cellular therapies, including certain LDTs, which are regulated by the FDA under the Federal Food, Drug, and Cosmetic Act ("FDCA");
- test ordering, documentation of tests ordered, billing practices and claims payment under the U.S. Centers for Medicare & Medicaid Services ("CMS") and the U.S. Department of Health and Human Services ("HHS") Office of Inspector General ("OIG") enforcing those laws and regulations;
- cellular therapies, medical device and *in vitro* diagnostic clearance, marketing authorization or approval;
- laboratory anti-mark-up laws;
- the handling and disposal of medical and hazardous waste;
- fraud and abuse laws such as the False Claims Act, the Anti-Kickback Statute ("AKS"), the Criminal Health Care Fraud Statute and The Ethics in Physician Referrals Act ("Stark Law");
- Occupational Safety and Health Administration rules and regulations;
- the Health Insurance Portability and Accountability Act of 1996 ("HIPAA") and other federal and state medical data privacy and security laws;
- the Genetic Information Nondiscrimination Act ("GINA") and similar state laws; and
- coverage and restrictions on coverage and reimbursement for research services, kits, clinical diagnostics and cellular therapies and Medicare, Medicaid, other governmental payors and private insurers reimbursement levels.

In particular, the laws, regulations and policies governing the marketing of RUO products, LDTs and clinical diagnostic tests and services are extremely complex and in many instances there are no significant regulatory or judicial interpretations of these laws and regulations. For example, our immunoSEQ research services and kits offered as RUO could, in the future, be subject to greater regulation by the FDA pursuant to the medical device provisions of the FDCA beyond the current regulations governing RUO labeling. The FDA defines a medical device to include any instrument, apparatus, implement, machine, contrivance, implant, *in vitro* reagent or other similar or related article, including a component, part or accessory, intended for use in the diagnosis of disease or other conditions, or in the cure, mitigation, treatment or prevention of disease, in man or other animals. Our clonoSEQ diagnostic tests and related clinical products, including our clinical laboratory tests that are *in vitro* diagnostic products, are diagnostic products that are considered by the FDA to be medical devices, and are subject to the requirement for marketing authorization prior to commercialization. We obtained marketing authorization for clonoSEQ as currently commercially marketed through the FDA's *de novo* review and authorization process. Among other things, pursuant to the FDCA and its

implementing regulations, the FDA regulates the research, design, testing, manufacturing, safety, labeling, storage, recordkeeping, premarket clearance, authorization or approval, marketing and promotion, and sales and distribution of medical devices in the United States to ensure they are safe and effective. In addition, the FDA regulates the import and export of medical devices. If we do not comply with these requirements, or later become subject to these requirements and fail to adequately comply, our business operations may be harmed. These requirements may additionally cause delays in our or our collaborators' ability to market and sell our products or services, which may, directly or indirectly, reduce our revenue, adversely affect our results of operations and financial condition and harm our business.

The insurance coverage and reimbursement status of newly approved products and services, in a new category of diagnostics and therapeutics, is uncertain. Failure to obtain or maintain adequate coverage and reimbursement for current or future products and services could limit our ability, and that of our collaborators, to fully commercialize our products and services and decrease our ability to generate revenue.

The availability and extent of reimbursement by governmental and private payors is essential for most patients to be able to afford the clinical diagnostic tests and cellular therapeutics that we and our collaborators currently or plan to develop and sell. In addition, because our clinical diagnostics and therapeutic products and services represent new approaches to the research, diagnosis, detection and treatment of diseases, we cannot accurately estimate how our products and services, and those jointly created with our collaborators, would be priced, whether reimbursement could be obtained or any potential revenue generated. Sales of our products and services will depend substantially, both domestically and internationally, on the extent to which the costs of our products and services are paid by health maintenance, managed care, pharmacy benefit and similar healthcare management organizations, or reimbursed by government health administration authorities, private health coverage insurers and other third-party payors. If reimbursement is not available, or is available only to limited levels, we may not be able to successfully commercialize some of our products or services. Even if coverage is provided, the approved reimbursement amount may not be high enough to allow us to establish or maintain pricing sufficient to realize a sufficient return on our investment in any of our products or services. Changes in the reimbursement landscape may occur, which are outside of our control, and may impact the commercial viability of our products and services.

There is significant uncertainty related to the insurance coverage and reimbursement of newly cleared, authorized or approved products and services. In the United States, many significant decisions about reimbursement for new diagnostics and medicines are typically made by CMS, an agency within the HHS. CMS decides whether and to what extent a new diagnostic or medicine will be covered and reimbursed under Medicare. Private payors tend to follow CMS to a substantial degree. It is difficult to predict what CMS will decide with respect to reimbursement for novel products and services such as ours. Additionally, reimbursement agencies in Europe may be more conservative than CMS. For example, a number of cancer drugs have been approved for reimbursement in the United States and have not been approved for reimbursement, or have been approved under restricted conditions, in certain European countries.

Outside the United States, the reimbursement process and timelines vary significantly. Certain countries, including a number of member states of the EU, set prices and make reimbursement decisions for diagnostics and pharmaceutical products, or medicinal products, as they are commonly referred to in the EU, with limited participation from the marketing authorization or Conformité Européene ("CE") mark holders, or may take decisions that are unfavorable to the authorization or CE mark holder where they have participated in the process. We cannot be sure that such prices and reimbursement decisions will be acceptable to us or our collaborators. If the regulatory authorities in these foreign jurisdictions set prices or make reimbursement criteria that are not commercially

attractive for us or our collaborators, our revenues and the potential profitability of our products and services in those countries would be negatively affected. An increasing number of countries are taking initiatives to attempt to control the healthcare budget by focusing cost-cutting efforts on medicinal products, and to a lesser extent, medical devices, provided under their state-run healthcare systems. These international price control efforts have impacted all regions of the world, but have been most prominent in the EU. Additionally, some countries require approval of the sale price of a product before it can be marketed or mandatory discounts or profit caps may be applied. Further, after the sale price is approved, it remains subject to review during the product lifecycle. In many countries, the pricing review period begins after marketing or product licensing approval is granted or the CE mark is obtained. As a result, we or our collaborators might obtain marketing approval for a product or service in a particular country, but then may experience delays in the reimbursement approval or be subject to price regulations that would delay the commercial launch of our product or service, possibly for lengthy time periods, which could negatively impact the revenues we are able to generate from the sale of that product or service in that particular country.

Moreover, increasing efforts by governmental and third-party payors, in the United States and abroad, to cap or reduce healthcare costs may cause such organizations to limit both coverage and level of reimbursement for newly cleared, authorized or approved devices and medicines and, as a result, they may not cover or provide adequate payment for our clinical diagnostics or the cellular therapies to be sold by us or our collaborators. For example, the U.S. government recently released a “blueprint,” or plan, to reduce the cost of drugs. This blueprint contains certain measures that HHS is already working to implement. At the state level, legislatures are increasingly passing legislation and implementing regulations designed to control pharmaceutical and biological program pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, which are, in some cases, designed to encourage importation from other countries and bulk purchasing.

We expect to experience pricing pressures on our clinical diagnostics and cellular therapies sold by us and our collaborators due to the trend toward value-based pricing and coverage, the increasing influence of health maintenance organizations and additional legislative changes. The downward pressure on healthcare costs in general, particularly prescription drugs and surgical procedures and other treatments, has become very intense. As a result, increasingly high barriers are being erected to the entry of new products.

Our business could be harmed by the loss, suspension or other restriction on a license, certification or accreditation, or by the imposition of a fine or penalties, under CLIA, its implementing regulations or other state, federal and foreign laws and regulations affecting licensure or certification, or by future changes in these laws or regulations.

Federal law requires virtually all clinical laboratories to comply with CLIA, which generally involves becoming certified by the federal and state government for the testing that will be performed and complying with various operational, personnel, facilities administration, quality and proficiency testing requirements intended to ensure that testing services are accurate and reliable. CLIA certification is also a prerequisite to be eligible to bill state and federal healthcare programs, as well as many private third-party payors, for laboratory research and clinical diagnostic testing services. As a condition of our CLIA certification, our Seattle, Washington laboratory is subject to survey and inspection every other year, additional random inspections and surprise inspections based on complaints received by state or federal regulators. The biennial survey and inspection is conducted by CMS, a CMS agent or, if the laboratory holds a CLIA certificate of accreditation, a CMS-approved accreditation organization, such as the College of American Pathologists (“CAP”). Sanctions for failure to comply with CLIA requirements, including proficiency testing violations, may include suspension, revocation or limitation of a laboratory’s CLIA certificate, which is necessary to conduct business, as well as the imposition of

significant civil, administrative or criminal sanctions against the lab, its owners and other individuals. In addition, we are subject to regulation under certain state laws and regulations governing laboratory licensure. Some states, including Washington, have enacted laboratory licensure and compliance laws that are more stringent than CLIA. Changes in state licensure laws that affect our ability to offer and provide research and diagnostic products and services across state or foreign country lines could materially and adversely affect our business. In addition, state and foreign requirements for laboratory certification may be costly or difficult to meet and could affect our ability to receive specimens from certain states or foreign countries.

Any sanction imposed under CLIA, its implementing regulations or state or foreign laws or regulations governing licensure, or our failure to renew a CLIA certificate, a state or foreign license or accreditation, could have a material adverse effect on our business.

Changes in law relating to health insurance coverage and payment may adversely affect our business.

In the United States, there have been and continue to be a number of legislative initiatives to contain healthcare costs. For example, in March 2010, the Affordable Care Act ("ACA") was passed, which substantially changes the way healthcare is financed by both governmental and private insurers, and significantly impacts the U.S. clinical diagnostic and biopharmaceutical industries. The ACA, among other things, increased the minimum Medicaid rebates owed by manufacturers under the Medicaid Drug Rebate Program, extended the rebate program to individuals enrolled in Medicaid managed care organizations, established annual fees and taxes on manufacturers of certain branded prescription drugs and medical devices, including laboratory kits, and promoted a new Medicare Part D coverage gap discount program. Considerable uncertainty remains regarding the implementation and impact of the ACA.

Some of the provisions of the ACA have yet to be fully implemented and certain provisions have been subject to judicial and Congressional challenges. The TCJA includes a provision repealing the tax-based shared responsibility payment imposed by the ACA on certain individuals who fail to maintain qualifying health coverage for all or part of a year, which is commonly referred to as the "individual mandate." CMS has recently proposed regulations that would give states greater flexibility in setting benchmarks for insurers in the individual and small group marketplaces, which may have the effect of relaxing the essential health benefits required under the ACA for plans sold through such marketplaces. Further, on October 13, 2017, an Executive Order was signed terminating the cost-sharing reduction ("CSR") subsidies that reimburse insurers under the ACA. The loss of the CSR payments is expected to increase premiums on certain policies issued by qualified health plans under the ACA. Another Executive Order was signed directing federal agencies with authorities and responsibilities under the ACA to waive, defer, grant exemptions from or delay the implementation of any provision of the ACA that would impose a fiscal burden on states or a cost, fee, tax, penalty or regulatory burden on individuals, healthcare providers, health insurers or manufacturers of pharmaceuticals or medical devices. More recently, the U.S. District Court for the Northern District of Texas struck down the ACA, deeming it unconstitutional given that Congress repealed the individual mandate in the Jobs Act. Although this decision has been stayed pending the outcome of an appeal to the Fifth Circuit Court of Appeals, it is unclear how this decision, subsequent appeals and other efforts to repeal and replace the ACA will impact the ACA. It is also unclear how regulatory provisions and sub-regulatory guidance, which fluctuate continually, may affect interpretation and implementation of the ACA and its practical effects on our business.

The ACA has provided health insurance coverage or expanded Medicaid coverage for many Americans that were previously uninsured. Recent efforts to reduce the scope of the ACA, however, appear to have impeded the growth of the insured population. In addition, given the challenges to the

ACA at the federal and state levels, the future outlook for insurance coverage remains uncertain. Changes in the number of patients that can look to third-party payment to help afford our products and services may affect the demand for these products and services.

With the current presidential administration and Congress, there may be additional administrative or legislative changes, including reinstatement, modification, repeal or replacement of all, or certain provisions of, the ACA. However, it remains to be seen whether new legislation modifying the ACA will be enacted and, if so, precisely what the new legislation will provide, when it will be enacted and what impact it will have on the availability of healthcare and containing or lowering the cost of healthcare. The implications, if any, of a potential repeal or replacement of the ACA on our and our collaborators' business and financial condition are not yet clear.

The ACA levied an excise tax of 2.3% of the sale price of medical devices sold in the United States, on any entity that manufactures or imports medical devices, including laboratory kits, offered for sale in the United States. After being in effect for two years, the tax was temporarily suspended until December 31, 2019. We do not know if the tax will be further suspended, repealed or revised. The potential financial impact this tax may have on our business is unclear and may be negative.

Other legislative changes have been proposed and adopted since the ACA was enacted. For example, in August 2011, the Budget Control Act of 2011, as amended, reduced funding under certain conditions to several government programs, including aggregate reductions to Medicare payments to providers of up to 2% per fiscal year, which remain in effect through 2027. In addition, the CMS has promulgated or amended a number of cost containment and value-based reimbursement measures in the ordinary course of business, and is expected to continue revising its regulations and policies in response to changes in law, administration policy and market conditions.

Post approval or authorization, the delivery of healthcare in the EU, including the establishment and operation of health services and the pricing and reimbursement of medicines and devices, is almost exclusively a matter of national, rather than EU, law and policy. National governments and health service providers have different priorities and approaches to the delivery of healthcare and the pricing and reimbursement of products and services. In general, however, the healthcare budgetary constraints in most EU member states have resulted in restrictions on the pricing and reimbursement of medicines and devices. Coupled with ever-increasing EU and national regulatory burdens on those wishing to develop and market products and services, this could prevent or delay marketing approval of our and our collaborators' products in development, restrict or regulate post-approval activities, and affect our ability to commercialize any products or services for which we obtain marketing approval.

We expect that additional foreign, state and federal healthcare reform measures or proposals will be adopted in the future, any of which could limit the amounts that federal and state governments will pay for healthcare products and services, which could result in reduced demand for our products and services or additional pricing pressures. In the event that the pricing structures for healthcare products change materially and limit payments for our products and services, our business will be adversely impacted because our products or services may no longer be commercially viable based on their expected net present value, we may have invested significant resources in products and services that cannot be commercially developed or marketed, or we may determine that products or services that have reached an early phase of development cannot or will not be taken into further development. In addition, products or services that are part of our collaborations may no longer be deemed commercially viable to pursue based on our collaborators' assessments of the impact of any proposed, announced or legislated pricing reforms.

We cannot predict what healthcare reform initiatives may be adopted in the future. Further federal, state and foreign legislative and regulatory developments are likely, and we expect ongoing initiatives to increase downward pressure on drug and device pricing. Such reforms could have an

adverse effect on anticipated revenues from our products and services, including those that we jointly develop with our collaborators, and may affect our overall financial condition and ability to develop or obtain regulatory clearance, authorization or approval for our products and services.

Inadequate funding for the FDA, the SEC and other government agencies could hinder their ability to hire and retain key leadership and other personnel, prevent new products and services from being developed or commercialized in a timely manner or otherwise prevent those agencies from performing normal business functions on which the operation of our business may rely, which could negatively impact our business.

The ability of the FDA to review and clear, authorize or approve new products can be affected by a variety of factors, including government budget and funding levels, ability to hire and retain key personnel, and statutory, regulatory and policy changes. In addition, government funding of the SEC and other government agencies on which our operations may rely, including those that fund research and development activities, is subject to the political process, which is inherently fluid and unpredictable.

Disruptions at the FDA and other agencies may also slow the time necessary for new drugs and devices to be reviewed and cleared, authorized or approved by necessary government agencies, which would adversely affect our business. For example, over the last several years, the U.S. government has shut down several times and certain regulatory agencies, such as the FDA and the SEC, have had to furlough critical FDA, SEC and other government employees and stop critical activities. If a prolonged government shutdown occurs, it could significantly impact the ability of the FDA to timely review and process our regulatory submissions, which could have a material adverse effect on our business. Further, upon the closing of this offering and in our operations as a public company, future government shutdowns could impact our ability to access the public markets and obtain necessary capital in order to properly capitalize and continue our operations.

We must maintain compliance with FDA requirements for our products and services and failure to maintain compliance with FDA requirements may prevent or delay the marketing of our products and services.

Even after we have obtained marketing authorization, as we have for clonoSEQ, we must comply with the scope of that clearance, authorization or approval. Failure to comply with those limitations or the additional, extensive and ongoing post-marketing obligations imposed by the FDA or other regulatory requirements of other regulatory agencies could result in unanticipated compliance expenditures, a range of administrative enforcement actions, injunctions and criminal prosecution. FDA post-market obligations include, among other things, compliance with the FDA Quality System Regulation (“QSR”), establishing registration and device listings, labeling requirements, reporting of certain adverse events and malfunctions, and reporting of certain recalls. In addition, circumstances may arise that cause us to recall equipment used in connection with our products and services. Such recalls could have an adverse effect on our ability to provide those products and services, which in turn would adversely affect our financial condition. Our collaborators will also be required to maintain FDA clearance, authorization or approval for the products and services that we jointly develop. Any failure by us or our collaborators to maintain such clearance, authorization or approval could impair or cause a delay in our ability to profit from these collaborations.

Products and services offered RUO may be subject to regulatory scrutiny.

Certain of our products are currently labeled and sold for RUO and not for the diagnosis or treatment of disease. Because such products are not intended for diagnostic use, and the products do not include clinical or diagnostic claims or provide directions for use as diagnostic products, they are

not subject to the same level of regulation by the FDA as medical devices. In particular, while the FDA regulations require that RUO products be appropriately labeled, "For Research Use Only," the regulations do not subject such products to the FDA's pre- and post-market controls for medical devices. Pursuant to FDA guidance on RUO products, a company may not make clinical or diagnostic claims about an RUO product or provide clinical directions or clinical support services to customers of RUO products. A product labeled RUO but deemed by the FDA to be intended for clinical diagnostic use may be viewed by the FDA as adulterated and misbranded under the FDCA and subject to FDA enforcement action. The FDA considers the totality of the circumstances surrounding distribution and use of a product labeled as RUO, including how the product is marketed and to whom, when determining its intended use. If the FDA were to disagree with our RUO classification or modify its approach to regulating products labeled for RUO, we could experience reduced revenue or increased compliance and other costs, which could adversely affect our business, prospects, results of operations and financial condition. In the event that the FDA requires marketing authorization of our RUO products in the future, the FDA may not ultimately grant any clearance, authorization or approval requested by us in a timely manner, or at all.

Future changes in FDA enforcement discretion for LDTs could subject our operations to much more significant regulatory requirements.

In addition to offering the FDA *de novo* marketing authorized version of clonoSEQ as a test for MRD in certain blood cancers, we also currently offer an LDT version of this test and other NGS-based LDTs for MRD ("NGS-based MRD"). The FDA has a policy of enforcement discretion with respect to LDTs whereby the FDA does not actively enforce its medical device regulatory requirements for such tests. However, in October 2014, the FDA issued two draft guidance documents stating that the FDA intended to modify its policy of enforcement discretion with respect to LDTs in a risk-based manner consistent with the existing classification of medical devices. Although the FDA halted finalization of the guidance in November 2016 to allow for further public discussion on an appropriate oversight approach to LDTs and to give Congressional authorizing committees the opportunity to develop a legislative solution, it is unclear if Congress or the FDA will modify the current approach to the regulation of LDTs in a way that would subject our current or future services marketed as LDTs to the enforcement of FDA regulatory requirements. The FDA Commissioner and the Director of the Center for Devices and Radiological Health ("CDRH") have expressed significant concerns regarding disparities between some LDTs and *in vitro* diagnostics that have been reviewed, cleared, authorized or approved by the FDA. If the FDA were to determine that NGS-based MRD tests offered as LDTs are not within the policy for LDTs for any reason, including new rules, policies or guidance, or due to changes in statute, our tests may become subject to extensive FDA requirements or otherwise impact our business. If the FDA were to disagree with our LDT status or modify its approach to regulating LDTs, we could experience reduced revenue or increased costs, which could adversely affect our business, prospects, results of operations and financial condition. If required, the regulatory marketing authorization process required to bring our current or future LDTs into compliance may involve, among other things, successfully completing additional clinical validations and submitting to and obtaining clearance from the FDA for a premarket clearance (510(k)) submission or authorization for a *de novo* or approval of a Premarket Approval Application ("PMA"). Furthermore, pending legislative proposals, if passed, such as the Verifying Accurate, Leading-edge IVCT Development Act of 2018, could create new or different regulatory and compliance burdens on us and could have a negative effect on our ability to keep products on the market or develop new products, which could have a material effect on our business. In the event that the FDA requires marketing authorization of our LDTs in the future, the FDA may not ultimately grant any clearance, authorization or approval requested by us in a timely manner, or at all. In addition, if the FDA inspects our laboratory in relation to the marketing of our FDA-authorized clonoSEQ test, any enforcement action the FDA takes might not be limited to the FDA-authorized clonoSEQ test and could encompass our NGS-based MRD testing service.

For each product and service we are developing that requires FDA premarket review prior to marketing, the FDA may not grant clearance, authorization or premarket approval and failure to obtain necessary approvals for our future products and services would adversely affect our ability to grow our business.

Before we begin to manufacture, label and market additional clinical diagnostic products for commercial diagnostic use in the United States, we may be required to obtain either clearance, marketing authorization or approval from the FDA, unless an exemption applies or the FDA exercises its enforcement discretion and refrains from enforcing its requirements. For example, the FDA currently has a policy of refraining from enforcing its medical device requirements with respect to LDTs, which the FDA considers to be a type of *in vitro* diagnostic test that is designed, manufactured and used within a single properly licensed laboratory.

The process of obtaining PMA is much more rigorous, costly, lengthy and uncertain than the 510(k) clearance process. In the PMA approval process, the FDA must determine that a proposed device is safe and effective for its intended use based, in part, on extensive data, including, but not limited to, technical, preclinical, clinical trial, manufacturing and labeling data. Conversely, in the 510(k) clearance process, the FDA must determine that a proposed device is "substantially equivalent" to a legally marketed "predicate" device in order for the product to be cleared for marketing. To be "substantially equivalent," the proposed device must have the same intended use as the predicate device, and either have the same technological characteristics or if it has different technological characteristics as the predicate device, the proposed device must be as safe and effective as, and not raise different questions of safety or effectiveness than, the predicate device. Clinical data is sometimes required to support substantial equivalence. For lower-risk devices that would otherwise automatically be placed into Class III, which require a PMA because no predicate device is available and the devices do not fall within an existing 510(k)-exempt classification, an applicant may submit a *de novo* request to down classify the device into Class II or Class I, which would not require a PMA. In the *de novo* process, the FDA must determine that general and special controls are sufficient to provide reasonable assurance of the safety and effectiveness of a device, which is low to moderate risk and has no predicate. In other words, the applicant must justify the "down-classification" to Class I or II for a new product type that would otherwise automatically be placed into Class III, but is lower risk. Clinical data may be required. For laboratory tests for which FDA clearance, authorization or approval is required, the FDA may also require data to support analytical and clinical validity.

The 510(k), *de novo* and PMA processes can be expensive and lengthy and require the payment of significant fees, unless an exemption applies. The FDA's 510(k) clearance pathway usually takes from three to nine months from submission, but it can take longer for a novel type of product. The FDA's *de novo* classification pathway usually takes from six to 12 months, but for many applicants can take up to 18 months or more.

The process of obtaining a PMA generally takes from one to three years, or even longer, from the time the PMA is submitted to the FDA until an approval is obtained. Any delay or failure to obtain necessary regulatory clearances, authorizations or approvals would have a material adverse effect on our business, financial condition and prospects.

The FDA can delay, limit or deny clearance, authorization or approval of a device for many reasons, including:

- the inability to demonstrate to the satisfaction of the FDA that the products are safe or effective for their intended uses;
- the disagreement of the FDA with the design, conduct or implementation of the clinical trials or the analysis or interpretation of data from preclinical studies, analytical studies or clinical trials;

- serious and unexpected adverse device effects experienced by participants in clinical trials;
- the data from preclinical studies, analytical studies and clinical trials may be insufficient to support clearance, authorization or approval, where required;
- the inability to demonstrate that the clinical and other benefits of the device outweigh the risks;
- an advisory committee, if convened by the FDA, may recommend against approval of a PMA or other application or may recommend that the FDA require, as a condition of approval, additional preclinical studies or clinical trials, limitations on approved labeling or distribution and use restrictions, or even if an advisory committee makes a favorable recommendation, the FDA may still not approve the product;
- the FDA may identify deficiencies in our marketing application;
- the FDA may identify deficiencies in our or our collaborators' manufacturing processes, facilities or analytical methods;
- the potential for policies or regulations of the FDA or applicable foreign regulatory bodies to change significantly in a manner rendering clinical data or regulatory filings insufficient for clearance, authorization or approval; and
- the FDA or foreign regulatory authorities may audit clinical trial data and conclude that the data is not sufficiently reliable to support a PMA application.

There are numerous FDA personnel assigned to review different aspects of marketing submissions, which can present uncertainties based on their ability to exercise judgment and discretion during the review process. During the course of review, the FDA may request or require additional data and information, and the development and provision of these data and information may be time-consuming and expensive. The process of obtaining regulatory clearances, authorizations or approvals to market a medical device can be costly and time-consuming, and we may not be able to obtain these clearances, authorizations or approvals on a timely basis, or at all for our products in development. If we are unable to obtain clearance, authorization or approval for any products for which we plan to seek clearance, authorization or approval, our business may be harmed.

Modifications to our products with FDA marketing authorization may require new FDA clearances, authorizations or approvals, or may require us to cease marketing or recall the modified clinical diagnostic products or future clinical products until clearances are obtained.

Any modification to a 510(k)-cleared device that significantly affects its safety or effectiveness, or that constitutes a major change in its intended use, could require a new 510(k) clearance, a new *de novo* authorization or approval of a PMA. The FDA requires every manufacturer to make this determination in the first instance, but the FDA may review any manufacturer's decision. The FDA may not agree with our decisions regarding whether new clearances, authorizations or approvals are necessary.

For any product approved pursuant to a PMA, we would be required to seek supplemental approval for many types of modifications to the approved product. The FDA requires manufacturers in the first instance to determine whether a PMA supplement or other regulatory filing is needed or whether the change may be reported via the PMA Annual Report, but may disagree with a company's assessment.

If the FDA disagrees with our determination, which it may not review until we submit an annual report or the FDA conducts an inspection or other inquiry, and requires us to seek new clearances, authorizations or approvals for modifications to our previously cleared, authorized or approved clinical

diagnostic products for which we have concluded new clearances, authorizations or approvals are unnecessary, we may be required to cease marketing or distribution of these clinical diagnostic products or to recall the modified products until we obtain clearance, authorization or approval. We may also be subject to enforcement action, including, among other things, significant regulatory fines or penalties.

Our employees, principal investigators, consultants and collaborators may engage in misconduct or other improper activities, including non-compliance with regulatory standards and requirements and insider trading.

We are exposed to the risk of fraud or other misconduct by our employees, consultants and those of our collaborators. Misconduct by these parties could include intentional failures to comply with the regulations of the FDA and non-U.S. regulators, comply with healthcare fraud and abuse laws and regulations in the United States and abroad, report financial information or data accurately or disclose unauthorized activities to us. In particular, sales, marketing and business arrangements in the healthcare industry are subject to extensive laws and regulations intended to prevent improper marketing, fraud, misconduct, kickbacks, bribery, self-dealing and other abusive practices. These laws and regulations may restrict or prohibit a range of pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements. Such misconduct could also involve the improper use of information obtained in the course of clinical studies, which could result in regulatory sanctions and cause serious harm to our reputation. We currently have a code of conduct applicable to all of our employees, but it is not always possible to identify and deter employee misconduct. In addition, our code of conduct and the other precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses, or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to comply with these laws or regulations. If any such investigations or actions are instituted against us and we are not successful in defending ourselves or asserting our rights, those actions could result in the imposition of significant fines or other sanctions, which could have a significant impact on our business. We currently have a compliance program in accordance with the elements of an effective program outlined by the OIG, which could help mitigate damages, but cannot prevent all misconduct. Whether or not we are successful in defending against such actions or investigations, we could incur substantial costs, including legal fees, and divert the attention of management in defending ourselves against any of these claims or investigations.

If third-party payors, including commercial payors and government healthcare programs, do not provide coverage of, or adequate reimbursement for, our clinical diagnostic products, our commercial success will be negatively affected.

Our revenue depends in part on achieving broad coverage and reimbursement for our diagnostic tests from payors, including both commercial and government payors. Certain large commercial payors have issued policies that decline to cover testing methods that they regard as experimental or investigational. Other payors may issue similar non-coverage policies. If payors do not provide coverage of, or do not provide adequate reimbursement for, a substantial portion of the price of our diagnostic tests, we may need to seek payment from the patient where this is not precluded by law or contract, which may adversely affect demand for our tests. Coverage determinations by a payor may depend on a number of factors, including, but not limited to, a payor’s determination that a certain diagnostic test is appropriate, medically necessary or cost-effective. If we are unable to provide payors with sufficient evidence of the clinical utility and validity of our diagnostic tests, they may not provide coverage, or may provide limited coverage, which will adversely affect our revenues and our ability to succeed. To the extent that more competitors enter our markets, the availability of coverage and the reimbursement rate for our tests and new diagnostic products may decrease as we encounter pricing pressure from our competitors.

Each payor makes its own decision regarding coverage of our tests and the applicable payment rates, and payors may not provide adequate coverage or reimbursement for our current or future products. Although we may contract with certain payors, working with payors through contract or otherwise to assure reimbursement is time-consuming and costly and outcomes are uncertain. In addition, the determinations by a payor whether to cover our clinical diagnostic product and the amount it will reimburse for them are often made on an indication-by-indication basis. In cases where there is no coverage policy or we do not have a contracted rate for reimbursement as a participating provider, the patient is typically responsible for a greater share of the cost of the test, which may result in further delay of our revenue, increase our collection costs or decrease the likelihood of collection. Through our Adaptive Assist patient support program, we provide clonoSEQ diagnostic tests for reduced rates or without charge to qualified low-income patients that may result in payors requiring us to provide evidence of eligibility of such patients to pay reduced out-of-pocket amounts.

Our claims for reimbursement from payors may be denied upon submission, and we may need to take additional steps to receive payment, such as appealing the denials. Such appeals and other processes are time-consuming, expensive and may not result in payment. Payors may perform audits of historically paid claims and attempt to recoup funds years after the funds were initially distributed if the payors believe the funds were paid in error or determine that our clonoSEQ diagnostic tests or other clinical diagnostic products were medically unnecessary. In addition, similar to federal payors, state and federal laws permit commercial payors to seek civil and criminal penalties against a manufacturer if they feel they have been defrauded. If a payor audits our claims and issues a negative audit finding, and we are not able to overturn the audit findings through appeal, the recoupment may result in a material adverse effect on our revenue. Additionally, in some cases commercial payors for whom we are not a participating provider may elect at any time to review claims previously paid and determine the amount they paid was too much. In these situations, the payor will typically notify us of their decision and then offset whatever amount they determine they overpaid against amounts they owe us on current claims. We do not have a mechanism to dispute these retroactive adjustments and we cannot predict when, or how often, a payor might engage in these reviews.

Future Medicare payment rates are uncertain.

In March 2018, CMS issued a National Coverage Determination (“NCD”) for molecular diagnostic laboratory testing services utilizing a NGS methodology, which includes our clinical diagnostic products, for Medicare beneficiaries with advanced cancer. In the NCD, CMS states that such tests are covered nationally when: (i) performed in a CLIA-certified laboratory; (ii) ordered by a treating physician; (iii) the patient meets certain clinical and treatment criteria; (iv) the test is approved or cleared by the FDA as a companion *in vitro* diagnostic for an FDA-approved or cleared indication for use in that patient’s cancer; and (v) results are provided to the treating physician for management of the patient using a report template to specify treatment options. The NCD also states that each Medicare Administrative Contractor (“MAC”) may determine coverage of other NGS tests in its jurisdiction for patients with advanced cancer when the test is performed by a CLIA-certified laboratory, ordered by a treating physician and the patient meets the same clinical and treatment criteria required of nationally covered NGS tests under the NCD.

In January 2019, Noridian Healthcare Solutions (“Noridian”), the MAC that processes our laboratory’s Medicare Part B claims, issued written guidance based on the MAC authority to cover NGS tests not explicitly covered under the NCD that provides coverage for our FDA-authorized clonoSEQ test for assessment of MRD in patients with ALL or MM. Because all clonoSEQ tests are performed within Noridian’s jurisdiction, this policy applies to all of our testing billed under Medicare Part B. At the same time, three other MACs issued the same guidance.

Noridian's guidance (A56270, clonoSEQ Assay for Assessment of MRD in Patients with Specific Lymphoid Malignancies) provides for payment for a single episode of testing and considers testing for MRD with clonoSEQ to constitute a series of assays to be billed at the start of each episode of testing. Medicare's Part B payment rate for clonoSEQ, because the test is billed with a "miscellaneous" code, is determined by the MAC. Noridian has agreed to pay our claims for clonoSEQ at an adequate rate, which will be reviewed annually. This guidance may not persist in its current form and it may not be followed by other MACs or Medicare Advantage ("MA") plans. And because MA plans are not required to reimburse lab tests at the Medicare Part B rate to in-network labs, if we become in-network for a given MA plan, our reimbursement may be lower than what we previously received from Noridian. It is possible that Noridian will further limit or even withdraw coverage or reduce its reimbursement amount, which will negatively affect our revenue. It is also possible CMS will revise or clarify the NCD in a way that will further limit or withdraw coverage for clonoSEQ. Further, if in the future we were to develop kits for sale to other laboratories, Part B coverage of those tests would be governed by the coverage policies of the MACs where these laboratories are located, which may be different from Noridian's policy or may not cover clonoSEQ at all. Noridian's policy has been adopted by three other MACs participating in the MolDx program, but it may not necessarily be followed by other MACs. Finally, if clinicians increase the frequency of testing for their Medicare-covered patients and our rate for a single episode of testing is not correspondingly increased, our costs would increase without a corresponding increase in revenue, and our financial results would be negatively impacted.

Under Medicare Part B, payment for most diagnostic laboratory tests is made under the Clinical Laboratory Fee Schedule ("CLFS"), which assigns payment amounts to tests based on billing codes. Under the Protecting Access to Medicare Act of 2014 ("PAMA"), certain laboratories that receive the majority of their Medicare revenue from payments made under the CLFS or Medicare's Physician Fee Schedule are required to report to CMS every three years, or annually for "advanced diagnostic laboratory tests," commercial payor payment rates and volumes for tests they perform and that are assigned specific billing codes. PAMA has special provisions relating to "advanced diagnostic laboratory tests," as defined by the statute, and these provisions affect the rate-setting at the time of launch and the periodicity of rate reporting and revision. Laboratories that fail to report the required payment information may be subject to substantial civil monetary penalties. Currently, the only test we offer commercially, our clonoSEQ diagnostic test, is coded with a "miscellaneous" code, and under CMS' guidance laboratories do not report rates and volumes for such tests. If, in the future, clonoSEQ or any of our tests are assigned a specific code we would be required to report commercial payor payment data on those tests. Payments for tests billed under miscellaneous codes are determined by the MACs, which also have discretion to change those payment rates.

CMS uses the data reported by laboratories to calculate a payment rate for each CLFS test, other than those coded with miscellaneous codes and certain others, based on the volume-weighted median of the private payor rates. These rates apply for three years, except that payment rates for advanced diagnostic laboratory tests apply for one year. This rate-setting apparatus is not currently applicable to clonoSEQ because clonoSEQ is coded with a miscellaneous code. If, in the future, clonoSEQ is assigned a specific code or if we offer other tests with specific codes, this apparatus would apply. Under these circumstances, Medicare's payment rates would be determined by the rates we and other laboratories, if any, with tests that share the specific codes we use, obtain from commercial payors. In that case, if we are unable to obtain and maintain adequate reimbursement rates from commercial payors, this may adversely affect our Medicare rates. If Noridian reduces our payment rate or MA plans pay us less than Noridian, this would adversely affect our financial condition, results of operations, cash flow and revenue. In addition, CMS is considering changes to its NCD for molecular diagnostic laboratory testing services using a NGS methodology. Any changes made by CMS to the NCD could affect our Medicare rates and those of other laboratory testing services covered by the NCD.

In some circumstances, our tests may be furnished to hospital inpatients and paid by Medicare under different rules. For example, when a specimen is obtained from a patient who is at the time classified by Medicare as a hospital inpatient, Medicare would not make a separate payment for the test and we would have to look to the hospital for payment. We do not know how often this will occur or whether hospitals will resist paying us for our tests. In this situation, Medicare coverage would be determined by the MAC for the jurisdiction where the hospital is located, which may not cover our tests.

Our RUO, clinical diagnostic and therapeutic products or services, and those jointly developed with our collaborators, may in the future be subject to product or service recalls. A recall of products or services, either voluntarily or at the direction of the FDA or another governmental authority, or the discovery of serious safety issues with our or our collaborators' products or services, could have a significant adverse impact on us.

The FDA has the authority to require the recall of commercialized products or services that are subject to FDA regulation. Manufacturers may, under their own initiative, recall a product or service if any deficiency is found. The FDA requires that certain corrections and removals, including recalls intended to reduce a health risk, be reported to the FDA within ten working days of initiating such correction or removal. For reportable corrections and removals, companies are required to make additional periodic submissions to the FDA after initiating the recall, and often engage with the FDA on their recall strategy prior to initiating the recall. A government-mandated or voluntary recall by us, one of our distributors or our collaborators could occur as a result of an unacceptable health risk, component failures, failures in laboratory processes, malfunctions, manufacturing errors, design or labeling defects, or other deficiencies and issues. Recalls of any of our commercialized products or services or those jointly developed with our collaborators would divert managerial and financial resources and adversely affect our reputation, results of operations and financial condition. We may also be subject to liability claims, be required to bear other costs or take other actions that may negatively impact our future sales and our ability to generate profits. Companies are also required to maintain certain records of corrections and removals, even if these do not require reporting to the FDA. We or our collaborators may initiate voluntary recalls involving our commercialized products or services in the future that we determine do not require FDA notification. If the FDA disagrees with our determinations, they may require us to report those actions as recalls. A future recall announcement by us or our collaborators could harm our reputation with customers and negatively affect our results of operations and financial condition. In addition, the FDA or other agency could take enforcement action for failing to report the recalls when they were conducted.

If we or our collaborators initiate a recall, including a correction or removal, for one of our commercialized products or services, issue a safety alert, or undertake a field action or recall to reduce a health risk, this could lead to increased scrutiny by the FDA, other governmental and regulatory enforcement bodies, and our or our collaborators' customers regarding the quality and safety of our products and services, and to negative publicity, including FDA alerts, press releases, or administrative or judicial actions. Furthermore, the submission of these reports could be used against us by competitors and cause customers to delay purchase decisions or cancel orders, which would harm our reputation.

Any additional commercialized products and services or any future products and services that obtain regulatory clearance, authorization, approval, accreditation or licensure will remain subject to regulatory scrutiny and our failure to maintain our regulatory clearances, authorizations, approvals, accreditations or licensures could adversely affect our reputation, business and results of operations.

Even if we or our collaborators obtain regulatory clearance, authorization, approval, accreditation or licensure in a jurisdiction for our products and services, the applicable regulatory authority may still impose significant restrictions on the indicated uses or marketing of our products and services, or impose ongoing requirements for potentially costly post-approval studies or post-market surveillance of

our or our collaborators' manufacturing and distribution. Advertising for certain devices and labeling, including promotional labeling, for all devices must comply with FDA requirements. In addition, device advertising and promotion may also be subject to other federal and state laws. For example, the FDA shares jurisdiction over the regulation of device advertising with the U.S. Federal Trade Commission ("FTC"). Advertising for devices characterized as restricted by the FDA is subject to specified FDA requirements, while advertising for non-restricted devices is regulated by the FTC.

If we or our collaborators fail to comply with applicable regulatory requirements following clearance, authorization, approval, accreditation or licensure of any of our products and services, a regulatory agency may:

- initiate an inspection of our or our collaborators' facilities;
- issue an untitled or warning letter asserting that we or our collaborators are in violation of law;
- seek an injunction or impose civil or criminal penalties or monetary fines;
- suspend or withdraw regulatory clearance, authorization or approval, or revoke a license or accreditation;
- suspend any ongoing clinical studies;
- delay or refuse clearance, authorization or approval of a pending regulatory submission or supplement submitted by us or our collaborators;
- impose restrictions on our or our collaborators' cleared, authorized, approved, accredited or licensed products or services;
- seize or recall the product or service;
- partially suspend or entirely shut down our or our collaborators' manufacturing or laboratory operations;
- issue advisories or other field actions;
- impose operating restrictions;
- refuse to allow us or our collaborators to enter into supply contracts, including government contracts; or
- refer matters to U.S. the Department of Justice ("DOJ") or other enforcement or regulatory bodies.

Any government investigation of alleged violations of law could require us to expend significant time and resources in response and could generate negative publicity. The occurrence of any event or penalty described above may inhibit our and our collaborators' ability to commercialize any cleared, authorized or approved products and services and generate revenues.

If any of our diagnostic products or services cause or contribute to a death or serious injury, or malfunction in certain ways, we will be required to report such death, serious injury or malfunction under applicable medical device reporting regulations, and such events can result in voluntary corrective actions or agency enforcement actions.

Under FDA medical device reporting ("MDR") regulations, medical device manufacturers are required to report to the FDA information that a device has or may have caused or contributed to a death or serious injury or has malfunctioned in a way that would likely cause or contribute to a death or serious injury if the malfunction of the device or one of our similar devices were to recur. If such a

death, serious injury or malfunction were to occur, and we or our collaborators are unable to demonstrate that the adverse events were caused by factors other than our or our collaborator's products and services, regulatory authorities could order us to cease further development of, or deny clearance, authorization or approval of, any of our or our collaborators' products and services for any or all targeted indications. Even if we and our collaborators are able to demonstrate that any serious adverse events are not related to our products and services, such occurrences could affect patient recruitment or the ability of enrolled trial participants to complete the trial. Moreover, if we or our collaborators elect, or are required, to delay, suspend or terminate any clinical trial of any product in development, the commercial prospects of such product in development may be harmed and our ability to generate product revenues may be delayed or eliminated. Any of these occurrences may harm our and our collaborators' ability to identify and develop future products and services, and may significantly harm our business, financial condition, result of operations and prospects.

We are subject to various laws and regulations, such as healthcare fraud and abuse laws, false claim laws and health information privacy and security laws, among others, and failure to comply with these laws and regulations may have an adverse effect on our business.

Healthcare providers, physicians, hospitals and third-party payors often play a primary role in the recommendation and prescription of any currently marketed products and services for which we may obtain clearance, authorization or approval. Our current and future arrangements with healthcare providers, physicians, hospitals and third-party payors, and our sales, marketing and educational activities related to our products and services, may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations at the federal and state level that may constrain our business or financial arrangements, and the relationships through which we market, sell and distribute our products and services. In addition, our operations are also subject to various federal and state fraud and abuse, physician payment transparency, and privacy and security laws, including, without limitation:

- The AKS, which prohibits, among other things, persons and entities, including clinical laboratories, from knowingly and willfully soliciting, receiving, offering or paying remuneration, whether directly or indirectly, overtly or covertly, in case or in kind, to induce or reward or in return for either the referral of an individual or the purchase, lease, order or recommendation of an item or service reimbursable, in whole or in part, under a federal healthcare program such as Medicare or Medicaid. The AKS has been interpreted broadly to apply to, among other things, arrangements between clinical laboratories and prescribers and purchasers of our tests. The term "remuneration" expressly includes kickbacks, bribes or rebates and has been broadly interpreted to include anything of value, including gifts, discounts, waivers of payment, ownership interests and any goods or services provided at less than their fair market value. We are also subject to the Beneficiary Inducement Statute set forth in the civil monetary penalty provisions of the AKS. There are several statutory exceptions and regulatory safe harbors protecting certain common activities from prosecution or other regulatory sanctions, however, these exceptions and safe harbors are drawn narrowly, and practices that do not fit squarely within an exception or safe harbor may be subject to scrutiny. The failure to meet all of the requirements of a particular statutory exception or regulatory safe harbor does not make the conduct *per se* illegal under the AKS. Instead, the legality of the arrangement will be evaluated on a case-by-case basis based on a cumulative review of the facts and circumstances to determine whether one purpose of the remuneration in the arrangement was to induce referrals or generate business that is payable by a federal healthcare program. A violation of the AKS may be grounds for the government or a whistleblower to assert that a claim for payment of items or services resulting from such violation constitutes a false or fraudulent claim for purposes of the False Claims Act. Moreover, certain AKS safe harbors currently protecting rebates paid by device manufacturers to third parties may later be repealed pursuant to a

pending regulatory proposal. Our practices may not meet all of the criteria for safe harbor protection from AKS liability in all cases. A person or entity does not need to have actual knowledge of the AKS or specific intent to violate any AKS provisions to have committed a violation.

- The Substance Use-Disorder Prevention that Promoted Opioid Recovery and Treatment for Patients and Communities Act of 2018 ("SUPPORT Act"), which was signed into law in October 2018. Section 8122 of the SUPPORT Act, known as Eliminating Kickbacks in Recovery Act of 2018 ("EKRA"), establishes an all-payor anti-kickback prohibition that extends to arrangements with recovery homes, clinical laboratories and clinical treatment facilities. EKRA includes a number of statutory exceptions, and directs agencies to develop further exceptions. Current EKRA exceptions in some cases reference, and in others differ from, the AKS safe harbors. Significantly, the EKRA prohibitions apply to the soliciting or receipt of remuneration for any referrals to recovery homes, clinical treatment facilities or clinical laboratories, whether or not related to the treatment of substance use disorders. Further, the EKRA prohibitions cover the payment or offer of remuneration to induce a referral to, or in exchange for, an individual using the services of such providers. EKRA creates additional risk that relationships with referral sources could be problematic.
- Federal civil and criminal false claims laws and civil monetary penalty laws, including the False Claims Act, which prohibits individuals or entities from, among other things, knowingly presenting, or causing to be presented, claims for payment to, or approval by, the federal government that are false, fictitious or fraudulent, or knowingly making, using or causing to be made or used a false record or statement material to a false or fraudulent claim to avoid, decrease or conceal an obligation to pay money to the federal government. As a result of a modification made by the Fraud Enforcement and Recovery Act of 2009, a claim includes "any request or demand" for money or property presented to the federal government. The False Claims Act also permits a private individual acting as a "whistleblower" to bring actions on behalf of the federal government alleging violations of the False Claims Act and to share in any monetary recovery. In addition, AKS violations implicate the False Claims Act. Conduct that results in a False Claims Act violation may also implicate various federal criminal statutes.
- HIPAA, which imposes criminal and civil liability for knowingly and willfully executing, or attempting to execute, a scheme to defraud or to obtain, by means of false or fraudulent pretenses, representations or promises, any money or property owned by, or under the control or custody of, any healthcare benefit program, including private third-party payors, and knowingly and willfully falsifying, concealing or covering up by trick, scheme or device, a material fact or making any materially false, fictitious or fraudulent statement in connection with the delivery of or payment for healthcare benefits, items or services. Similar to the AKS, a person or entity does not need to have actual knowledge of HIPAA or specific intent to violate any HIPAA provisions to have committed a violation.
- The Stark Law, which is directed at "self-referral," prohibits, with certain exceptions, referrals for certain designated health services ("DHS"), including laboratory services, that are covered by Medicare and Medicaid by physicians who personally, or through a family member, have an investment or ownership interest in, or a compensation arrangement with, an entity performing the tests. The prohibition also extends to payment for any testing referred in violation of the Stark Law. Because the Stark Law is a strict liability statute, proof of specific intent to violate the law is not a required element of a violation. Any person who engages in a scheme to circumvent the Stark Law's referral prohibition may be fined up to $100,000 for each such arrangement or scheme. In addition, any person who presents or causes to be presented a claim to Medicare or Medicaid in violation of the Stark Law is subject to civil monetary penalties of up to $15,000 per bill submission, an assessment of up to three times the amount claimed and possible exclusion from participation in federal governmental payor programs, and those

claims are considered false claims for which the parties to the arrangement may be liable under the False Claims Act. Bills submitted in violation of the Stark Law may not be paid by Medicare or Medicaid, and any person collecting any amounts with respect to any such prohibited bill is obligated to refund such amounts. Many states have comparable laws that are not limited to Medicare and Medicaid referrals. The Stark Law also places an annual cap, currently at $416 for 2019, on the amount of non-monetary compensation, which consists of meal spend and educational items, that a company can spend on a physician in the aggregate. This annual cap requires careful tracking and coordination and if it is exceeded, as long as the amount exceeded is less than 50% of the total annual cap and is recouped from the physician within 180 calendar days or before the end of the calendar year, it is not a violation. This "return" option may only be used once every three years with respect to the same referring physician. We occasionally enter into financial relationships, usually compensation relationships, such as a consulting arrangement, with physicians who refer patients for testing. If these arrangements do not meet the Stark Law's requirements, any claims submitted to Medicare or Medicaid could violate the law and put both the physician referral source and us at risk.

- The administrative simplification provisions of HIPAA, as amended and supplemented by the Health Information Technology for Economic and Clinical Health Act of 2009 ("HITECH") impose, among other things, obligations, including mandatory contractual terms, with respect to safeguarding the privacy, security and transmission of protected health information ("PHI") held by certain healthcare providers, health plans and healthcare clearinghouses, known as covered entities, and their respective business associates. Among other things, HITECH made certain aspects of HIPAA's rules, notably the "HIPAA Security Rule," directly applicable to business associates, independent contractors or agents of covered entities that create, receive, maintain or transmit PHI in connection with providing a function on behalf of, or a service to, a covered entity. HITECH also created four new tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates and gave state attorneys general new authority to file civil actions for damages or injunctions in federal court to enforce the federal HIPAA regulation and seek attorney's fees and costs associated with pursuing federal civil actions. The HHS Office for Civil Rights ("OCR") has increased its focus on compliance and continues to train state attorneys general for enforcement purposes. The OCR has recently increased both its efforts to audit HIPAA compliance and its level of enforcement, with one recent penalty exceeding $16 million.
- GINA, which restricts employers and health insurance companies from requiring or using the results of genetic tests in specific contexts and does not provide a private right of action. A number of states have also adopted laws regarding genetic tests, some aligned with GINA and some with broader applicability, including granting broader rights to individuals.
- The federal physician payment transparency requirements ("Physician Payments Sunshine Act") created under the ACA, and its implementing regulations, which requires applicable manufacturers of covered drugs, devices, biologics and medical supplies for which payment is available under Medicare, Medicaid or the State Children's Health Insurance Program, with certain exceptions, to annually report to HHS information related to certain payments or other transfers of value made or distributed to physicians and teaching hospitals, or to entities or individuals at the request of, or designated on behalf of, physicians and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members. The Physician Payments Sunshine Act has been extended to payments and transfers of value to physician assistants, nurse practitioners and other mid-level healthcare providers, with reporting requirements going into effect in 2022 for payments and transfers of value made to these practitioners in 2021. In addition, certain state and local laws may impose additional transparency and healthcare compliance requirements on medical device manufacturers, as well as certain restrictions or limits on interactions with healthcare professionals.

- The Federal Trade Commission Act ("FTCA"), which the FTC interprets to require taking appropriate steps to secure consumers' personal information and considers the failures to do so to constitute unfair acts or practices in or affecting commerce in violation of Section 5(a) of the FTCA. The FTC expects a company's data security measures to be reasonable and appropriate in light of the sensitivity and volume of consumer information it holds, the size and complexity of its business, and the cost of available tools to improve security and reduce vulnerabilities. Medical data is considered sensitive data that merits stronger safeguards, and the FTC's guidance for appropriately securing consumers' personal information is consistent with what is required by the HIPAA Security Rule. Some states, most notably Massachusetts and Nevada, also have adopted laws requiring the implementation of security measures to protect personal information, and all 50 states and the District of Columbia, Puerto Rico and Guam, have adopted breach notification laws.
- Analogous state laws and regulations, such as state anti-kickback, self-referral and false claims laws, which may apply to items or services reimbursed by any third-party payor, including commercial insurers, and in some cases even in self-pay scenarios. In addition, some state laws require life sciences companies to comply with the industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government, or to impose transparency requirements or restrictions on marketing activities.
- Various state, federal and foreign laws and regulations govern our ability to communicate, prospect, advertise and market our products and services through email, phone, text messages, facsimile and online methods.

Because of the breadth of these laws and the narrowness of the exceptions and safe harbors available under them, it is possible that certain of our business activities could be subject to challenge under one or more of such laws. The scope and enforcement of each of these laws is uncertain and subject to rapid change in the current environment of healthcare reform, especially in light of the lack of applicable precedent and regulations. Federal and state enforcement bodies have recently increased their scrutiny of the ongoing interactions between healthcare companies and healthcare providers, which has led to a number of investigations, prosecutions, convictions and settlements in the healthcare industry. Ensuring that business arrangements with third parties comply with applicable healthcare laws, as well as responding to possible investigations by government authorities, can be time- and resource-consuming and can divert management's attention from our business.

If our operations are found to be in violation of any of the health regulatory laws described above or any other laws that apply to us, we may be subject to penalties, including, but not limited to, criminal, civil and administrative penalties, damages, fines, disgorgement, individual imprisonment, possible exclusion from participation in government healthcare programs, injunctions, private *qui tam* actions brought by individual whistleblowers in the name of the government and the curtailment or restructuring of our operations, as well as additional reporting obligations and oversight if we become subject to a corporate integrity agreement or other agreement to resolve allegations of non-compliance with these laws, any of which could adversely affect our ability to operate our business and our results of operations.

Our collection, use and disclosure of personal information, including health and employee information, is subject to state, federal and foreign privacy and security regulations, and our failure to comply with those regulations or to adequately secure the information we hold could result in significant liability or reputational harm.

The privacy and security of personal information stored, maintained, received or transmitted, including electronically, is a major issue in the United States and abroad. While we strive to comply with all applicable privacy and security laws and regulations, including, in our case, our own posted privacy policies, legal standards for privacy, including but not limited to ‘‘unfairness’’ and ‘‘deception,’’ as enforced by the FTC and state attorneys general, these laws and regulations continue to evolve and any failure or perceived failure to comply may result in proceedings or actions against us by government entities or others, or could cause us to lose customers, which could have a material adverse effect on our business. Recently, there has been an increase in public awareness of privacy issues in the wake of revelations about the data-collection activities of various government agencies and in the number of private privacy-related lawsuits filed against companies. Concerns about our practices with regard to the collection, use, retention, disclosure or security of personal information or other privacy-related matters, even if unfounded and even if we are in compliance with applicable laws, could damage our reputation and harm our business. Additionally, we receive personal information, including PHI from third parties, and if such third parties breach their representations to us regarding their compliance with applicable privacy and security laws, we could be exposed to proceedings or actions by government agencies or others.

Numerous foreign, federal and state laws and regulations govern the collection, dissemination, use and confidentiality of personal information, including genetic, biometric and health information, including state privacy, data security and breach notification laws, federal and state consumer protection and employment laws, HIPAA, GINA, the General Data Protection Regulation (“GDPR”) and other foreign data protection laws. These laws and regulations are increasing in complexity and number, may change frequently and sometimes conflict.

The HIPAA privacy, security and breach notification regulations, including the expanded requirements under HITECH, establish comprehensive federal standards with respect to the uses and disclosures of PHI by health plans, healthcare providers, including laboratories, and healthcare clearinghouses, in addition to setting standards to protect the confidentiality, integrity and security of PHI. The regulations establish a complex regulatory framework on a variety of subjects, including:

- the circumstances under which uses and disclosures of PHI are permitted or required without a specific authorization by the patient;
- a patient’s rights to access, amend and receive an accounting of certain disclosures of PHI;
- requirements to notify individuals if there is a breach of their unsecured PHI;
- the contents of notices that must be provided to patients regarding our privacy practices for PHI;
- administrative, technical and physical safeguards required of entities that use or receive PHI; and
- the safeguarding of PHI.

Penalties for violations of these laws vary. For instance, penalties for failure to comply with a requirement of HIPAA and HITECH vary significantly, and include civil monetary penalties of up to $50,000 per violation, which cap has been increased to account for inflation, not to exceed $1.5 million per calendar year, which cap has been increased to account for inflation, for each provision of HIPAA that is violated and, in certain circumstances, criminal penalties with fines up to $250,000 per violation

and imprisonment. However, a single breach can result in findings of violations of multiple provisions, leading to possible penalties in excess of $1.5 million for violations in a calendar year. Any person who knowingly obtains or discloses PHI in violation of HIPAA may face a criminal penalty of up to $50,000 and up to one year of imprisonment. The criminal penalties increase if the wrongful conduct involves false pretenses or the intent to sell, transfer or use identifiable health information for commercial advantage, personal gain or malicious harm. In addition, responding to government investigations regarding alleged violations of these and other laws and regulations, even if they ultimately result in no findings of violations or no penalties imposed, can consume our resources and impact our business and, if public, harm our reputation.

Computer networks are vulnerable to breach and unauthorized persons may in the future be able to exploit weaknesses in the security systems of our computer networks and gain access to PHI. Additionally, we share PHI with third-party contractors, and while they are contractually obligated under business associate agreements to safeguard and maintain the confidentiality of PHI, their indemnification of us would not insulate us from reputational harm. Unauthorized persons may be able to gain access to PHI stored in such third-party contractors' computer networks. Any wrongful use or disclosure of PHI by us or our third-party contractors, including disclosure due to data theft or unauthorized access to our or our third-party contractors' computer networks, could subject us to fines or penalties that could adversely affect our business and results of operations. Although HIPAA and the regulations promulgated thereunder do not provide for a private right of action, we could incur damages under state laws to private parties for the wrongful use or disclosure of confidential health information or other private personal information.

Further, various states, such as California and Massachusetts, have implemented similar privacy laws and regulations, such as the California Confidentiality of Medical Information Act, that impose restrictive requirements regulating the use and disclosure of health information and other personal information. These laws and regulations are not necessarily preempted by HIPAA, but they afford greater protection to individuals than HIPAA. Where state laws are more protective, we and our collaborators must comply with the stricter provisions where they apply. In addition to fines and penalties imposed upon violators, some of these state laws also afford private rights of action to individuals who believe their personal information has been misused. California's patient privacy laws, for example, provide for penalties of up to $250,000 and permit injured parties to sue for damages. The California Consumer Privacy Act ("CCPA"), which goes into effect on January 1, 2020 and will be enforceable by the California Attorney General the sooner of six months after the publication of the final regulators or July 1, 2020, creates new data privacy obligations for covered companies and provides new privacy rights to California residents, including the right to access, delete, obtain and opt in or opt out of certain use, sharing or sale of their personal information and to sue for statutory damages for certain security breaches. Although legislators have stated that they intend to propose amendments to the CCPA before its enforcement date and that the California Attorney General will issue clarifying regulations, there is no certainty that the CCPA's burdens will be significantly altered. And although the CCPA includes limited exceptions from its prescriptions, including exceptions for certain information collected as part of clinical trials, as specified in the law, and for PHI collected by covered entities or business associates subject to HIPAA, as specified in the law, the CCPA may regulate or impact our processing of PHI and other personal information depending on the context. It remains unclear what, if any, modifications will be made to this legislation or how it will be interpreted. The interplay of federal and state laws may be subject to varying interpretations by courts and government agencies, creating complex compliance issues for us and our customers and potentially exposing us to additional expense, adverse publicity and liability. Further, as regulatory focus on privacy, security and data use issues continues to increase and laws and regulations concerning the protection of personal information expand and become more complex, these potential risks to our immune medicine platform and related products and services could intensify. Changes in laws or regulations associated with the enhanced protection of certain types of sensitive data, such as PHI,

along with increased customer demand for enhanced data security infrastructure, could greatly increase the cost of providing our products and services, decrease demand for our products and services, reduce our revenue and subject us to additional liabilities.

In addition, the interpretation and application of consumer, health-related and data protection laws, especially with respect to genetic samples and data, in the United States, the EU and elsewhere, are often uncertain, contradictory and in flux. We may eventually operate in a number of countries outside of the United States whose laws may in some cases be more stringent than the requirements in the United States. For example, the EU has specific requirements relating to cross-border transfers of personal data to certain jurisdictions, including to the United States. In addition, some countries have stricter consumer notice or consent requirements relating to personal data collection, use or sharing, have more stringent requirements relating to organizations' privacy programs and provide stronger individual rights. Moreover, international privacy and data security regulations may become more complex and result in greater penalties. For instance, as of May 25, 2018, the GDPR, has replaced the EU Data Protection Directive with respect to the collection and use of personal data of data subjects in the EU and the European Economic Area ("EEA"). The GDPR applies extra-territorially under certain circumstances and imposes stringent requirements on controllers and processors of personal data, including, for example, requirements to obtain consent or other legal bases from individuals to process their personal data, provide robust disclosures to individuals, accommodate a set of individual data rights, provide data security breach notifications within 72 hours after discovering the breach, limit retention of personal information and apply enhanced protections to health data and other special categories of personal data. The GDPR also applies to pseudonymized data, which is defined as "the processing of personal data in such a way that the data can no longer be attributed to a specific data subject without the use of additional information," and imposes additional obligations when we contract with third-party processors in connection with the processing of any personal data. The GDPR provides that EU member states may make their own further laws and regulations limiting the processing of personal data, including genetic, biometric or health data, which could limit our ability to use and share personal data, could cause our costs to increase and could harm our financial condition. Failure to comply with the requirements of the GDPR and the applicable national data protection laws of the EU member states may result in fines of up to €20 million or up to 4% of the total worldwide annual turnover of our preceding fiscal year, whichever is higher, and other administrative penalties. Further, as the GDPR has only recently become enforceable, enforcement priorities and official interpretations of certain provisions are still unclear. To comply with the new data protection rules imposed by the GDPR, we may be required to put in place additional mechanisms ensuring compliance, which may result in other substantial expenditures. This may be onerous and adversely affect our business, financial condition, results of operations and the profitability of our platform of products and services. Failure to comply with the GDPR and other countries' privacy or data security-related laws, rules or regulations could result in material penalties imposed by regulators, affect our compliance with contracts entered into with our collaborators and other third-party payors, and have an adverse effect on our business and financial condition. Currently, the GDPR is only applicable to us as a processor, but as we continue to expand into the European market, the GDPR will have direct applicability to us as a controller.

The GDPR also imposes strict rules on the transfer of personal data out of the EU to the United States. These obligations may be interpreted and applied in a manner that is inconsistent from one jurisdiction to another and may conflict with other requirements or our practices. In addition, these rules are consistently under scrutiny. For example, following a decision of the Court of Justice of the EU in October 2015, the transfer of personal data to U.S. companies that had certified as members of the U.S. Safe Harbor Scheme ("Safe Harbor Scheme") was declared invalid. In July 2016, the European Commission adopted the EU-U.S. Privacy Shield Framework ("Privacy Shield Framework") which replaced the Safe Harbor Scheme. The Privacy Shield Framework is reviewed by European authorities annually, and there is currently litigation challenging other EU mechanisms for adequate data transfers.

It is uncertain whether the Privacy Shield Framework or the standard contractual clauses might similarly be invalidated by European courts.

Organizations operating in Canada and covered by the Personal Information Protection and Electronic Documents Act ("PIPEDA"), or equivalent Canadian provincial laws, must obtain an individual's consent when they collect, use or disclose that individual's personal information. Individuals have the right to access and challenge the accuracy of their personal information held by an organization, and personal information may only be used for the purposes for which it was collected. If an organization intends to use personal information for another purpose, it must again obtain that individual's consent.

Because of the breadth of these data protection laws and the narrowness of their exceptions and safe harbors, it is possible that our business or data protection policies could be subject to challenge under one or more of such laws. The scope and enforcement of each of these laws is uncertain and subject to rapid change in the current environment of heightened regulatory focus on data privacy and security issues. If our operations are found to be in violation of any of the data protection laws described above or any other laws that apply to us, we may be subject to penalties, including, but not limited to, criminal, civil and administrative penalties, damages, fines, disgorgement, individual imprisonment, possible exclusion from participation in government healthcare programs, injunctions, private *qui tam* actions brought by individual whistleblowers in the name of the government, class action litigation and the curtailment or restructuring of our operations, as well as additional reporting obligations and oversight if we become subject to a corrective action plan or other agreement to resolve allegations of non-compliance with these laws, any of which could adversely affect our ability to operate our business and our results of operations.

Security breaches, loss of data and other disruptions could compromise confidential, personal and sensitive information related to our business or prevent us from accessing critical information and expose us to liability, which could adversely affect our business and our reputation.

In the ordinary course of our business, we and our collaborators collect and store sensitive data, including PHI, personal information, credit card and other financial information, intellectual property and proprietary business information owned or controlled by ourselves or our customers, third-party payors, our collaborators, government entities, insurance companies and other parties. We manage and maintain our applications and data through a combination of on-site systems and cloud-based data centers. We utilize external security and infrastructure vendors to manage components of our data centers. We also transmit sensitive data, including patient data, telephonically, through our website and pursuant to arrangements with multiple third-party vendors and their subcontractors. These applications and data encompass a wide variety of critical business information, including research and development information, patient data, commercial information and financial information. We face a number of risks related to protecting this critical information, including loss-of-access risk, unauthorized access, use, disclosure or modification, and the risk of our inability to adequately monitor, audit and modify our respective control over our critical information. This risk extends to the data we entrust to the third-party vendors and subcontractors that help us manage this sensitive data or otherwise process it on our behalf.

The secure processing, storage, maintenance and transmission of this critical information are vital to our operations and business strategy, and we devote significant resources to protecting such information. Although we take reasonable measures to protect sensitive and proprietary data from unauthorized access, use or disclosure, no security measures can be perfect and our respective information technology and infrastructure may be vulnerable to attacks by hackers or viruses or breached due to employee error, malfeasance or other malicious or inadvertent disruptions. Any such

breach or interruption could compromise our networks and the information stored there could be accessed by unauthorized parties, publicly disclosed, lost or stolen. Any such access, breach or other loss of information could result in legal claims or proceedings, liability under federal or state laws that protect the privacy of personal information, such as HIPAA or HITECH, and regulatory penalties. Notice of breaches may be required to be provided to affected individuals, the Secretary of HHS or other federal, state and foreign regulators, the media or state attorneys general. Such a notice could harm our reputation and ability to compete. Although we have implemented security measures and formal, dedicated enterprise security programs to prevent unauthorized access to patient and other personal data, such data is currently accessible through multiple channels and we may experience one or more data breaches. Unauthorized access, loss or dissemination could also disrupt our operations and damage our reputation, which could adversely affect our results of operations and financial condition.

No TCR-based cellular therapies have been approved in this new potential category of medicines and may never be approved as a result of efforts by others or us. TCR-based cellular therapy drug discovery has substantial clinical development and regulatory risks due to the novel and unprecedented nature of this new category of immune-driven medicines.

As a potential new category of medicines, no TCR-based cellular therapies have been approved to date by the FDA or other regulatory agency. Successful discovery and development of TCR-based cellular therapies by us and our collaborators is highly uncertain and depends on numerous factors, many of which are beyond our and their control. We and our collaborators have made and will continue to make a series of business decisions and take calculated risks to advance our development efforts and pipeline of immune-driven therapeutic product candidates, including those related to TCR-based cellular therapies, delivery technology and manufacturing processes, which may be shown to be incorrect based on further work by us, our collaborators or others. Our cellular therapeutics product candidates that appear promising in the early phases of development may fail to advance, experience delays in the clinic, experience clinical holds or fail to reach the market for many reasons, including:

- discovery efforts identifying potential TCR-based cellular therapies may not be successful;
- nonclinical or preclinical study results may show potential TCR-based cellular therapies to be less effective than desired or to have harmful or problematic side effects;
- clinical trials may fail to meet one or more endpoints, or results may show the TCR-based cellular therapies to be less effective than expected or to have unacceptable side effects or toxicities;
- adverse effects relating to any one of our therapeutic product candidates or adverse effects relating to our TruTCR process may lead to delays in or termination of one or more of our products or services;
- the inability of our translational models to reduce risk or predict outcomes in humans, given that each component of our therapeutic product candidates may have a dependent or independent effect on safety, tolerability and efficacy, and that such effects may, among other things, be species-dependent;
- manufacturing failures or insufficient supply of current good manufacturing practices (“cGMP”) materials for future clinical trials, or higher than expected cost, could delay or set back clinical trials or make TCR-based cellular therapies commercially unattractive;
- our collaborators’ improvements in the manufacturing processes for this new class of potential immune-driven medicines may not be sufficient to satisfy the clinical or commercial demand of our jointly developed TCR-based cellular therapies or regulatory requirements for clinical trials;

- changes that we or our collaborators make to optimize manufacturing, testing or formulating of cGMP materials could impact the safety, tolerability and efficacy of our therapeutic products in development;
- pricing or reimbursement issues or other factors that delay clinical trials or make any TCR-based cellular therapies uneconomical or noncompetitive with other immunotherapies;
- failure to timely advance our or our collaborators' therapeutic products or receive the necessary regulatory clearances, authorizations or approvals or a delay in receiving such clearances, authorizations or approvals due to, among other reasons, slow or failure to complete enrollment in clinical trials, withdrawal by trial participants from trials, failure to achieve trial endpoints, additional time requirements for data analysis, data integrity issues, Biologics License Application or the equivalent application, discussions with the FDA or the European Medicines Agency, a regulatory request for additional nonclinical or clinical data, or safety formulation or manufacturing issues may lead to our inability to obtain sufficient funding; and
- the proprietary rights of others and their competing products and services that may prevent our TCR-based cellular therapies from being commercialized or threaten future commercialization activities.

Risks Relating to our Intellectual Property

We may not be successful in obtaining or maintaining sufficient intellectual property protection for our products, services and technologies and uses thereof, and the scope of the intellectual property protection obtained may not be sufficiently broad.

As is the case with other companies engaged in the life sciences industry, our success depends in large part on our ability to obtain and maintain protection of the intellectual property we may own solely and jointly with others, or license from third parties, particularly patents, in the United States and other countries with respect to our products, services and technologies. We rely on patent protection in addition to trademark, copyright, trade secret and other intellectual property rights protection and contractual restrictions to protect our proprietary technologies, all of which provide limited protection and may not adequately protect our rights or enable us to gain or maintain any competitive advantage. If we fail to protect our intellectual property, third parties may be able to compete more effectively against us. In addition, we may incur substantial litigation costs in our attempts to recover or restrict use of our intellectual property.

To the extent our intellectual property offers inadequate protection, or is found to be invalid or unenforceable, we would be exposed to a greater risk of direct competition. If our intellectual property does not provide adequate barriers to competition, our competitive position could be adversely affected, as could our business.

We apply for or in-license patents covering our products and technologies and uses thereof, as we deem appropriate. However, obtaining and enforcing patents is costly, time-consuming and complex, and we may fail to apply for patents on important products, services and technologies in a timely fashion or at all, or we may fail to apply for patents in potentially relevant jurisdictions. We may not be able to file and prosecute all necessary or desirable patent applications, or maintain, enforce and license any patents that may issue from such patent applications, at a reasonable cost or in a timely manner. It is also possible that we will fail to identify patentable aspects of our research and development output before it is too late to obtain patent protection. We may not have the right to control the preparation, filing and prosecution of patent applications or to maintain the rights to patents licensed from third parties. Consequently, these patents and applications may not be prosecuted and enforced in a manner consistent with the best interests of our business.

As of March 31, 2019, we own or have rights to 343 active patents and patent applications filed in the United States, Europe and elsewhere. Of these, there are 109 pending patent applications and 234 granted patents. Our pending patent applications may not result in issued patents in a timely fashion or at all. Even if patents are granted, they may not provide a basis for intellectual property protection of commercially viable products or services, may not provide us with any competitive advantages, or may be challenged and invalidated by third parties. It is also possible that others will design around our current or future patented technologies.

Some of our patents, licensed patents or patent applications may be challenged in the future, and we may not be successful in defending any such challenges. For example, we may be subject to a third-party pre-issuance submission of prior art to the U.S. Patent and Trademark Office ("USPTO"), or become involved in opposition, derivation, reexamination, *inter partes* review, post-grant review or interference proceedings challenging our patent rights. Any successful third-party challenge to our patents could result in patent claims being narrowed, or patents being invalidated or held unenforceable, in whole or in part, which could lead to increased competition to our business. Conversely, we may have to challenge the patents or patent applications of third parties. The outcome of patent litigation or other proceeding can be uncertain, and any attempt by us to enforce our patent rights against others or to challenge the patent rights of others may not be successful, or, if successful, may take substantial time and result in substantial cost, and may divert our efforts and attention from other aspects of our business. In addition, if the breadth or strength of protection provided by our patents and patent applications is threatened, regardless of the outcome, it could dissuade companies from collaborating with us to license, develop or commercialize current or future products or services. The patent positions of biotechnology companies can be highly uncertain and involve complex legal and factual questions for which important legal principles remain unresolved. Inconsistent policies regarding the eligibility for patent protection and the breadth of patentable claims in such companies' patents has emerged to date in the United States or elsewhere. Courts frequently render opinions in the biotechnology field that may affect the patentability of certain inventions or discoveries, including opinions that may affect the patentability of methods and compositions of matter useful in relation to immunosequencing.

The patent position of companies engaged in the development and commercialization of clinical diagnostic tests, like our clonoSEQ diagnostic test, are particularly uncertain. Various courts, including the U.S. Supreme Court, have rendered decisions that affect the eligibility and scope of patentability of certain inventions or discoveries relating to certain diagnostic tests and related technology. These decisions state, among other things, that a patent claim that recites an abstract idea, natural phenomenon or law of nature (for example, the relationship between particular immune receptors and cancer) may not be patentable. Precisely what constitutes a law of nature is uncertain, and it is possible that certain aspects of our clinical diagnostics would be considered natural laws. The evolving case law in the United States may adversely affect our ability to obtain patents or defend patents we have obtained or have licensed and may facilitate third-party challenges to any owned or licensed patents. The laws of some foreign countries do not protect intellectual property rights to the same extent or for the same subject matter as the laws of the United States, and we may encounter difficulties in protecting and defending such rights in foreign jurisdictions. The legal systems of many other countries do not favor the enforcement of patents and other intellectual property protection, particularly those relating to biotechnology, which could make it difficult for us to stop the infringement of our patents in such countries. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business.

We may not be able to protect our intellectual property rights throughout the world.

Filing, prosecuting and defending patents on our products and services in all countries throughout the world would be prohibitively expensive. In addition, the laws of some foreign countries do not

protect intellectual property rights to the same extent as the laws of the United States, and we may encounter difficulties in protecting and defending such rights in foreign jurisdictions. Consequently, we may not be able to prevent third parties from practicing our inventions in all countries outside the United States, or from selling or importing products made using our inventions in and into the United States or other jurisdictions. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop their own products and may also export infringing products to territories where we have patent protection, but enforcement is not as strong as that in the United States. These products may compete with our products and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing.

Many companies have encountered significant problems in protecting and defending intellectual property rights in foreign jurisdictions. The legal systems of many other countries do not favor the enforcement of patents and other intellectual property protection, particularly those relating to biotechnology, which could make it difficult for us to stop the infringement of our patents in such countries. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial cost and divert our efforts and attention from other aspects of our business, could put our patents at risk of being invalidated or interpreted narrowly and our patent applications at risk of not issuing, and could provoke third parties to assert claims against us. We may not prevail in any lawsuits that we initiate and the damages or other remedies awarded, if any, may not be commercially meaningful. Accordingly, our efforts to enforce our intellectual property rights around the world may be inadequate to obtain a significant commercial advantage from the intellectual property that we develop or license.

Changes in patent law in the United States and other jurisdictions could diminish the value of patents in general, thereby impairing our ability to protect our products and services.

Changes in either the patent laws or in interpretations of patent laws in the United States or other countries or regions may diminish the value of our intellectual property. We cannot predict the breadth of claims that may be allowed or enforced in our patents or in third-party patents. In the United States, prior to March 16, 2013, assuming that other requirements for patentability were satisfied, the first to invent the claimed invention was entitled to the patent, while outside the United States, the first to file a patent application was entitled to the patent. On or after March 16, 2013, under the Leahy-Smith America Invents Act (“America Invents Act”), enacted in September 16, 2011, the United States transitioned to a first inventor to file system in which, assuming that other requirements for patentability are satisfied, the first inventor to file a patent application will be entitled to the patent on an invention regardless of whether a third party was the first to invent the claimed invention. As such, a third party that files a patent application in the USPTO before us could be awarded a patent covering an invention of ours even if we had made the invention before it was made by such third party. This will require us to be cognizant of the time from invention to filing of a patent application. Since patent applications in the United States and most other countries are confidential for a period of time after filing or until issuance, we cannot be certain that we or our licensors were the first to either file any patent application related to our products or services or invent any of the inventions claimed in our or our licensor’s patents or patent applications.

The America Invents Act also includes a number of significant changes that affect the way patent applications will be prosecuted and also may affect patent litigation. These include allowing third-party submission of prior art to the USPTO during patent prosecution and additional procedures to attack the validity of a patent by USPTO administered post-grant proceedings, including post-grant review, *inter partes* review and derivation proceedings. Because of a lower evidentiary standard in USPTO proceedings compared to the evidentiary standard in U.S. federal courts necessary to invalidate a patent claim, a third party could potentially provide evidence in a USPTO proceeding sufficient for the USPTO to hold a claim invalid even though the same evidence would be insufficient to invalidate the claim if first presented in a district court action. Accordingly, a third party may attempt to use the

USPTO procedures to invalidate our patent claims that would not have been invalidated if first challenged by the third party as a defendant in a district court action. Therefore, the America Invents Act and its implementation could increase the uncertainties and costs surrounding the prosecution of our owned or in-licensed patent applications and the enforcement or defense of our owned or in-licensed issued patents, all of which could have a material adverse effect on our business.

Recent U.S. Supreme Court rulings have also narrowed the scope of patent protection available in certain circumstances and weakened the rights of patent owners in certain situations. In addition to increasing uncertainty with regard to our ability to obtain patents in the future, this combination of events has created uncertainty with respect to the value of patents, once obtained. Depending on decisions by the U.S. Congress, the federal courts and the USPTO, the laws and regulations governing patents could change in unpredictable ways that would weaken our ability to obtain new patents or to enforce our existing patents and patents that we might obtain in the future.

Issued patents covering our products and services could be found invalid or unenforceable if challenged.

The issuance of a patent is not conclusive as to its inventorship, scope, validity or enforceability and some of our patents or patent applications, including licensed patents, may be challenged, in courts or patent offices in the United States and abroad, in opposition, derivation, reexamination, *inter partes* review, post-grant review or interference. Additionally, if we and our licensing partners initiate or become involved in legal proceedings against a third party to enforce a patent covering one of our products or technologies, the defendant could counterclaim that the patent covering our product is invalid or unenforceable. In patent litigation in the United States, counterclaims alleging invalidity or unenforceability are commonplace. Grounds for a validity challenge could be an alleged failure to meet any of several statutory requirements, including patent eligible subject matter, lack of novelty, obviousness or non-enablement. Grounds for an unenforceability assertion could be an allegation that someone connected with prosecution of the patent withheld relevant information from the USPTO, or made a misleading statement, during prosecution. In addition, the United States now awards patent priority to the first party to file a patent application, and others may submit patent claims covering our inventions prior to us. The outcome following legal assertions of invalidity and unenforceability is unpredictable. With respect to the validity question, for example, we cannot be certain that there is no invalidating prior art, of which we and the patent examiner were unaware during prosecution. A successful third-party challenge to our patents could result in the unenforceability or invalidity of such patents, which could have a material adverse impact on our business. Furthermore, if the breadth or strength of protection provided by our patents and patent applications is threatened, regardless of the outcome, it could dissuade companies from collaborating with us to license, develop or commercialize current or future products and services.

We may not be aware of all third-party intellectual property rights potentially relating to our immune medicine platform, products and services. Publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are typically not published until approximately 18 months after filing or, in some cases, not until such patent applications issue as patents. We might not have been the first to make the inventions covered by each of our pending patent applications and we might not have been the first to file patent applications for these inventions. To determine the priority of these inventions, we may have to participate in interference proceedings, derivation proceedings or other post-grant proceedings declared by the USPTO. The outcome of such proceedings is uncertain, and other patent applications may have priority over our patent applications. Such proceedings could also result in substantial costs to us and divert our management’s attention and resources.

We rely on licenses from third parties in relation to certain products and services and if we lose these licenses then we may be subjected to future litigation.

We are a party to license agreements that grant us rights to use certain intellectual property, including patents and patent applications, typically in certain specified fields of use. Some of those licensed rights could provide us with freedom to operate for aspects of our products and services. We may need to obtain additional licenses from others to advance our research, development and commercialization activities.

Our success may depend in part on the ability of our licensors to obtain, maintain and enforce patent protection for our licensed intellectual property. Our licensors may not successfully prosecute the patent applications we license. Even if patents issue in respect of these patent applications, our licensors may fail to maintain these patents, may determine not to pursue litigation against other companies that are infringing these patents or may pursue such litigation less aggressively than we would. Without protection for the intellectual property we license, other companies might be able to offer substantially identical products for sale, which could adversely affect our competitive business position and harm our business prospects.

Any of the foregoing could have a material adverse effect on our competitive position, business, financial conditions, results of operations and prospects.

Moreover, disputes may also arise between us and our licensors regarding intellectual property subject to a license agreement, including:

- the scope of rights granted under the license agreement and other interpretation-related issues;
- whether, and the extent to which, our products, services, technology and processes infringe on intellectual property of the licensor that is not subject to the licensing agreement;
- our right to sublicense patent and other rights to third parties under collaborative development relationships;
- our diligence obligations under the license agreement and what activities satisfy those diligence obligations;
- the inventorship and ownership of inventions and know-how resulting from the joint creation or use of intellectual property by our licensors and us and our collaborators; and
- the priority of invention of patented technology.

If we do not prevail in such disputes, we may lose any or all of our rights under such license agreements.

In addition, the agreements under which we currently license intellectual property or technology from third parties are complex and certain provisions in such agreements may be susceptible to multiple interpretations. The resolution of any contract interpretation disagreement that may arise could narrow what we believe to be the scope of our rights to the relevant intellectual property or technology, or increase what we believe to be our financial or other obligations under the relevant agreement, either of which could have a material adverse effect on our business, financial condition, results of operations and prospects. Moreover, if disputes over intellectual property that we have licensed prevent or impair our ability to maintain our current licensing arrangements on commercially acceptable terms, we may be unable to successfully develop and commercialize any affected products or services, which could have a material adverse effect on our business, financial conditions, results of operations and prospects.

Absent the license agreements, we may infringe patents subject to those agreements, and if the license agreements are terminated, we may be subject to litigation by the licensor. Litigation could

result in substantial costs to us and distract our management. If we do not prevail, we may be required to pay damages, including treble damages, attorneys' fees, costs and expenses and royalties or be enjoined from selling our products or services, which could adversely affect our ability to offer products or services, our ability to continue operations and our financial condition.

If we are unable to protect the confidentiality of our trade secrets, our business and competitive position would be harmed.

In addition to patent protection, we take steps to protect our intellectual property and proprietary technology by entering into agreements, including confidentiality agreements, non-disclosure agreements and intellectual property assignment agreements, with our employees, consultants, collaborators, academic institutions, life sciences research partners and, when needed, our advisers as well as other third parties. However, we cannot be certain that such agreements have been entered into with all relevant parties, and we cannot be certain that our trade secrets and other confidential proprietary information will not be disclosed or that competitors will not otherwise gain access to our trade secrets or independently develop substantially equivalent information and techniques.

For example, any of these parties may breach the agreements and disclose our proprietary information, including our trade secrets, and we may not be able to obtain adequate remedies for such breaches. Such agreements may not be enforceable or may not provide meaningful protection for our trade secrets or other proprietary information in the event of unauthorized use or disclosure or other breaches of the agreements, and we may not be able to prevent such unauthorized disclosure. If we are required to assert our rights against such party, it could result in significant cost and distraction. Monitoring unauthorized disclosure is difficult, and we do not know whether the steps we have taken to prevent such disclosure are, or will be, adequate. If we were to enforce a claim that a third party had illegally obtained and was using our trade secrets, it would be expensive and time-consuming, and the outcome would be unpredictable. In addition, courts outside the United States may be less willing to protect trade secrets.

We also seek to preserve the integrity and confidentiality of our confidential proprietary information by maintaining physical security of our premises and physical and electronic security of our information technology systems. Besides the possibility that these security measures could be breached, such measures may not, for example, in the case of misappropriation of a trade secret by an employee or third party with authorized access, provide adequate protection for our proprietary information. Our security measures may also not prevent an employee or consultant from misappropriating our trade secrets and providing them to a competitor, and recourse we take against such misconduct may not provide an adequate remedy to protect our interests fully. Enforcing a claim that a party illegally disclosed or misappropriated a trade secret can be difficult, expensive and time-consuming, and the outcome is unpredictable. In addition, trade secrets may be independently developed by others in a manner that could prevent legal recourse by us. If any of our confidential or proprietary information, such as our trade secrets, were to be disclosed or misappropriated, or if any such information was independently developed by a competitor, our competitive position could be harmed.

Certain former employees have obtained employment with companies or academic institutions that could be considered competitive with us. This competition may be limited by contractual provisions which may or may not be enforceable by us in certain jurisdictions. In addition, we may not be aware of such competitive employment arrangements until after our trade secrets have been disclosed to potentially competitive companies.

We may be subject to claims that our employees, consultants or independent contractors have wrongfully used or disclosed confidential information of third parties or that our employees have wrongfully used or disclosed alleged trade secrets of their former employers.

We employ, and expect to employ in the future, individuals who were previously employed at universities or other companies, including our competitors or potential competitors. Although we try to ensure that our employees, consultants and independent contractors do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that our employees, consultants or independent contractors have inadvertently or otherwise used or disclosed trade secrets or other proprietary information of their former employers or other third parties, or to claims that we have improperly used or obtained such trade secrets. Litigation may be necessary to defend against these claims. If we fail in defending such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel, which could adversely impact our business. A loss of key research personnel work product could hamper or prevent our ability to commercialize potential products and services, which could harm our business. Even if we are successful in defending against these claims, litigation could result in substantial costs and be a distraction to management and other employees.

We may not be able to protect and enforce our trademarks.

We have not yet registered certain of our trademarks in all of our potential markets, although we have registered Adaptive Biotechnologies, clonoSEQ, immunoSEQ, pairSEQ and TruTCR in the United States, the EU and a number of other countries and are seeking to register additional trademarks, including ADAPTIVE and immunoSEQ Dx. As we apply to register our unregistered trademarks in the United States and other countries, our applications may not be allowed for registration in a timely fashion or at all, and our registered trademarks may not be maintained or enforced. In addition, opposition or cancellation proceedings may be filed against our trademark applications and registrations, and our trademarks may not survive such proceedings. In certain countries outside of the United States, trademark registration is required to enforce trademark rights. If we do not secure registrations for our trademarks, we may encounter more difficulty in enforcing them against third parties than we otherwise would.

We may be subject to claims challenging the inventorship or ownership of our patents and other intellectual property.

We or our licensors may be subject to claims that former employees, collaborators or other third parties have an interest in our owned or in-licensed patents, trade secrets or other intellectual property as an inventor or co-inventor. Ownership disputes may arise, for example, from conflicting obligations of employees, consultants or others who are involved in developing our future products and services. Our Co-Founder, Dr. Harlan Robins, had dual employment with the Fred Hutchinson Cancer Research Center (“Fred Hutch”) and us, and accordingly has had obligations to assign his rights to inventions to either Fred Hutch or us depending on how and where the inventions were conceived, reduced to practice, developed or created. Disputes may arise in the future between Fred Hutch and us regarding ownership of intellectual property generated by Dr. Robins’ work. Fred Hutch may claim to have ownership rights to our intellectual property.

Litigation may be necessary to defend against these and other claims by a third party challenging inventorship of our or our licensors’ ownership of our owned or in-licensed patents, trade secrets or other intellectual property. If we or our licensors fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights, such as exclusive ownership of, or right to use, intellectual property that is important to our product or services. Alternatively, we may need to obtain one or more additional licenses from the third party which will be time-consuming and

expensive and could result in substantial costs and diversion of resources and could have a material adverse effect on our business. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees. Any of the foregoing could have a material adverse effect on our business, financial condition, results of operations and prospects.

If we become involved in patent litigation or other proceedings related to a determination of rights, we could incur substantial costs and expenses, substantial liability for damages or be required to stop our development and commercialization efforts of our products and services.

There is a substantial amount of litigation, both within and outside the United States, involving patent and other intellectual property rights in the life sciences, clinical diagnostics and drug discovery industries, including patent infringement lawsuits, declaratory judgment litigation and adversarial proceedings before the USPTO, including interferences, derivation proceedings, *ex parte* reexaminations, post-grant review and *inter partes* review, as well as corresponding proceedings in foreign courts and foreign patent offices.

We are currently involved in appeals from Opposition Proceedings at the European Patent Office related to two of our patents: EP2364368 and EP2387627. We may, in the future, become involved with litigation or actions at the USPTO or foreign patent offices with various third parties. We expect that the number of such claims may increase as our industry expands, more patents are issued, the number of products or services increases and the level of competition in our industry increases. Any infringement claim, regardless of its validity, could harm our business by, among other things, resulting in time-consuming and costly litigation, diverting management's time and attention from the development of our business, requiring the payment of monetary damages (including treble damages, attorneys' fees, costs and expenses) or royalty payments.

It may be necessary for us to pursue litigation or adversarial proceedings before the patent office in order to enforce our patent and proprietary rights or to determine the scope, coverage and validity of the proprietary rights of others. The outcome of any such litigation might not be favorable to us, and even if we were to prevail, such litigation could result in substantial costs and diversion of resources and could have a material adverse effect on our business, operating results or financial condition.

As we move into new markets and expand our products or services offerings, incumbent participants in such markets may assert their patents and other proprietary rights against us as a means of slowing our entry into such markets or as a means to extract substantial license and royalty payments from us. In addition, future litigation may involve patent holding companies or other adverse patent owners who have no relevant product or service revenue and against whom our own patents may provide little or no deterrence or protection.

Third parties may assert that we are employing their proprietary technology without authorization. Given that clinical diagnostics and drug discovery fields are intense and highly competitive areas, there may be third-party intellectual property rights that others believe could relate to our immune medicine platform, products and services. We have been approached on four occasions with an offer from a third-party patent owner or licensee to license rights to us under patents relating to immune medicine. We have been contacted by Invivoscribe, Inc. regarding U.S. Pat. No. 7,785,783 on March 24, 2012; by Keygene NV regarding U.S. Pat. No. 9,453,256 on October 10, 2016; by MorphoSys AG regarding EP Patent 2243030 and U.S. Pat. No. 9,404,929 on October 10, 2018; and by DName-iT NV regarding EP Patent 2201143 and U.S. Pat. No. 8,318,434 in December 2018. In each instance, we have declined to pursue licenses to the patents. One or more of these or other third-party patent owners or licensees may pursue or threaten to pursue litigation against us to enforce one or more patents. It would be costly and time-consuming to defend such claims.

Because patent applications can take many years to issue, there may be currently pending patent applications which may later result in issued patents that our current or future products, technologies and services may infringe. We cannot be certain that we have identified or addressed all potentially significant third-party patents in advance of an infringement claim being made against us. In addition, similar to what other companies in our industry have experienced, we expect our competitors and others may have patents or may in the future obtain patents and claim that making, having made, using, selling, offering to sell or importing our products or services infringes these patents. Defense of infringement and other claims, regardless of their merit, would involve substantial litigation expense and would be a substantial diversion of management and employee resources from our business. Parties making claims against us may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources. Parties making claims against us may be able to obtain injunctive or other relief, which could block our ability to develop, commercialize and sell products or services and could result in the award of substantial damages against us, including treble damages, attorney's fees, costs and expenses if we are found to have willfully infringed. In the event of a successful claim of infringement against us, we may be required to pay damages and ongoing royalties and obtain one or more licenses from third parties, or be prohibited from selling certain products or services. We may not be able to obtain these licenses on acceptable or commercially reasonable terms, if at all, or these licenses may be non-exclusive, which could result in our competitors gaining access to the same intellectual property. In addition, we could encounter delays in product or service introductions while we attempt to develop alternative products or services to avoid infringing third-party patents or proprietary rights. Defense of any lawsuit or failure to obtain any of these licenses could prevent us from commercializing products or services, and the prohibition of sale of any of our products or services could materially affect our business and our ability to gain market acceptance for our products or services.

Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation. In addition, during the course of this kind of litigation, there could be public announcements of the results of hearings, motions or other interim proceedings or developments. If securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock.

In addition, our agreements with some of our customers, suppliers or other entities with whom we do business require us to defend or indemnify these parties to the extent they become involved in infringement claims, including the types of claims described above. We could also voluntarily agree to defend or indemnify third parties in instances where we are not obligated to do so if we determine it would be important to our business relationships. If we are required or agree to defend or indemnify third parties in connection with any infringement claims, we could incur significant costs and expenses that could adversely affect our business, operating results or financial condition.

Patent terms may be inadequate to protect our competitive position on our products and services for an adequate amount of time.

Patents have a limited lifespan. In the United States, if all maintenance fees are timely paid, the natural expiration of a patent is generally 20 years from its earliest U.S. non-provisional filing date. Various extensions may be available, but the life of a patent, and the protection it affords, is limited. Even if patents covering our products and services are obtained, once the patent life has expired, we may be open to competition from competitive products. Given the amount of time required for the development, testing and regulatory review of new products and services, patents protecting such products and services might expire before or shortly after such products and services are commercialized. As a result, our owned and licensed patent portfolio may not provide us with sufficient rights to exclude others from commercializing products similar or identical to ours.

Risks Relating to our Common Stock and the Offering

An active trading market for our common stock may not develop.

Prior to this offering, there has been no public market for our common stock. It is possible that an active trading market may not develop following the closing of this offering or, if developed, may not be sustained. The lack of an active trading market may impair the value of your shares and your ability to sell your shares at the time you wish to sell them. An inactive trading market may also impair our ability to both raise capital by selling shares of common stock and acquire other complementary products, technologies or businesses by using our shares of common stock as consideration.

Upon the closing of this offering, our common stock will be listed on The Nasdaq Global Select Market. If we fail to satisfy the continued listing standards of The Nasdaq Global Select Market, however, we could be de-listed, which would negatively impact the price of our common stock.

The market price of our common stock is likely to be volatile and fluctuate substantially, and you may be unable to sell your shares at or above the offering price.

The initial public offering price for our shares of common stock will be determined by negotiations between us and representatives of the underwriters and may not be indicative of prices that will prevail in the trading market. In addition, the market price of our common stock is likely to be highly volatile and may fluctuate substantially due to many factors, including:

- the commencement or termination of our collaborations;
- the timing of achievement of specified milestones in the development of our products and services;
- introductions of new or expanded products or services or new pricing policies by us or by our competitors;
- changes in the status of our regulatory clearances, authorizations, approvals or applications, or those jointly developed with our collaborators;
- where required, the results of clinical trials of our future products and services, those jointly developed with our collaborators or those of our competitors;
- the success of competitive products or technologies;
- announcements by us or our competitors of significant acquisitions, collaborators or divestitures;
- changes in governmental regulations and regulatory or legal developments in the United States and other countries;
- developments or disputes concerning patent applications, issued patents or other proprietary rights;
- the recruitment or departure of key personnel;
- actual or anticipated changes in estimates as to financial results, development timelines or recommendations by securities analysts;
- variations in our financial results or those of companies that are perceived to be similar to us;
- changes in the structure of healthcare payment systems;
- market conditions in the life sciences, clinical diagnostics or drug discovery industry;
- general economic, industry and market conditions;

- sales of our securities, including sales by our directors, officers or significant shareholders;
- speculation about our business in the media or the investment community; and
- other factors, including factors unrelated to our operating performance or the operating performance of our competitors.

In recent years, the stock markets generally have experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of listed companies. If the market for stock in our industry or the stock market in general experiences uneven investor confidence, the market price of our common stock could decline for reasons unrelated to our business, operating results or financial condition. The market price of our common stock might also decline in reaction to events that affect other companies within, or outside, our industry even if these events do not directly affect us. If the market price of shares of our common stock after this offering does not ever exceed the initial public offering price, you may not realize any return on your investment in us and may lose some or all of your investment.

In the past, securities class action litigation has often been instituted against companies following periods of volatility in their stock price. This type of litigation, if instituted against us, could result in substantial costs to us and divert our management's attention and resources, which could seriously harm our business, financial condition, results of operations and prospects.

If securities analysts do not publish research or reports about our business, or we are the subject of negative publicity, the price of our stock could decline.

If a trading market for our common stock develops, the trading market will depend, in part, on the research and reports that securities or industry analysts publish about us or our business. We do not control these analysts. As a newly public company, we may be slow to attract research coverage and the analysts who publish information about our common stock may have had relatively little experience with us or our industry, which could affect their ability to accurately forecast our results and could make it more likely that we fail to meet their estimates. In the event securities or industry analysts initiate coverage, if one or more of the analysts who cover us downgrade our stock or publish inaccurate or unfavorable evaluations of our company or our stock, the price of our stock could decline. If one or more of these analysts cease coverage of our company or fail to publish reports covering our company regularly, our stock may lose visibility in the market, which in turn could cause our stock price to decline. In addition, if we are the subject of negative publicity, whether from an analyst, academic, industry group or the general or financial press, our stock price may decline.

We are an emerging growth company, and the reduced disclosure requirements applicable to emerging growth companies may make our common stock less attractive to investors.

We are an "emerging growth company," as defined in the JOBS Act. For as long as we continue to be an emerging growth company, we may take advantage of certain exemptions and relief from various reporting requirements that are applicable to other public companies that are not emerging growth companies, including (i) not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002 ("Sarbanes-Oxley Act"), (ii) having the option of delaying the adoption of certain new or revised financial accounting standards, (iii) reduced disclosure obligations regarding executive compensation in this prospectus and our periodic reports and proxy statements and (iv) exemptions from the requirements of holding a nonbinding advisory vote on executive compensation and shareholder approval of any golden parachute payments not previously approved. We may take advantage of these exemptions until such time that we are no longer an emerging growth company. Accordingly, the information contained herein may be different than the information you receive from other public companies in which you hold stock. Further, pursuant to

Section 107 of the JOBS Act, we have elected to take advantage of the extended transition period for complying with new or revised accounting standards until those standards would otherwise apply to private companies. As a result, our operating results and financial statements may not be comparable to the operating results and financial statements of other companies who have adopted the new or revised accounting standards. It is possible that some investors will find our common stock less attractive as a result, which may result in a less active trading market for our common stock and higher volatility in our stock price.

We will remain an emerging growth company until the earliest of (i) the last day of the fiscal year following the fifth anniversary of the closing of this offering, (ii) the last day of the fiscal year in which we have total annual gross revenue of at least $1.07 billion, (iii) the last day of the fiscal year in which we are deemed to be a “large accelerated filer” as defined in Rule 12b-2 under the Exchange Act, which would occur if the market value of our common stock held by non-affiliates exceeded $700.0 million as of the last business day of the second fiscal quarter of such year or (iv) the date on which we have issued more than $1.0 billion in non-convertible debt securities during the prior three-year period.

If our estimates or judgments relating to our critical accounting policies are based on assumptions that change or prove to be incorrect, our operating results could fall below our publicly announced guidance or the expectations of securities analysts and investors, resulting in a decline in the market price of our common stock.

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the amounts reported in our financial statements and accompanying notes. We base our estimates on historical experience and on various other assumptions that we believe to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets, liabilities, equity, revenue and expenses that are not readily apparent from other sources. As we work toward adopting and implementing the new revenue accounting standard, management will make judgments and assumptions based on our interpretation of the new standard. The new revenue standard is principle-based and interpretation of those principles may vary from company to company based on their unique circumstances. It is possible that interpretation, industry practice and guidance may evolve as we work toward implementing the new standard. If our assumptions change or if actual circumstances differ from our assumptions, our operating results may be adversely affected and could fall below our publicly announced guidance or the expectations of securities analysts and investors, resulting in a decline in the market price of our common stock.

If you purchase our common stock in this offering, you will incur immediate and substantial dilution in the book value of your shares.

Investors purchasing common stock in this offering will pay a price per share that substantially exceeds the pro forma as adjusted net tangible book value per share, which gives effect to the automatic conversion of all of our outstanding shares of convertible preferred stock into common stock, and the issuance of shares of our common stock upon the exercise of an outstanding warrant to purchase our common stock that would otherwise expire. As a result, investors purchasing common stock in this offering will incur immediate dilution of $ per share, based on the initial public offering price of $ per share, and our pro forma as adjusted net tangible book value per share as of March 31, 2019.

This dilution is due to the substantially lower price paid by our investors who purchased our capital stock prior to this offering, including on the exercise of options and warrants, as compared to

the price to the public in this offering. In addition, we have, in the past, issued options and other securities to acquire our common stock at prices significantly below the initial public offering price. If all of these outstanding warrants and options to purchase shares as of March 31, 2019 were exercised, our pro forma as adjusted net tangible book value would be $ per share, representing an immediate increase in pro forma as adjusted net tangible book value of $ per share to our existing shareholders and an immediate dilution of $ per share to new investors participating in this offering. For more information on the dilution you may suffer as a result of investing in this offering, see the "*Dilution*" section of this prospectus.

A significant portion of our total outstanding shares are restricted from immediate resale but may be sold into the market in the near future. The large number of shares eligible for public sale or subject to rights requiring us to register them for public sale could cause the market price of our common stock to drop significantly, even if our business is doing well.

Sales of a substantial number of shares of our common stock in the public market could occur at any time, subject to certain restrictions described below. These sales, or the perception in the market that the holders of a large number of shares intend to sell their shares, could depress the market price of our common stock and could impair our ability to raise capital through the sale of additional equity securities. We are unable to predict the effect that these sales may have on the prevailing market price of our common stock. Based on shares of our common stock outstanding as of March 31, 2019, we will have shares of our common stock outstanding after this offering. This includes the shares that we are selling in this offering, which may be resold in the public market immediately without restriction, unless purchased by our affiliates. Of the remaining shares, substantially all are currently restricted as a result of securities laws, market standoff agreements or 180-day lock-up agreements, but will be able to be sold after the offering as described in the "*Shares Eligible for Future Sale*" section of this prospectus. Subject to certain limitations, based on shares of our common stock outstanding as of March 31, 2019, approximately shares will become eligible for sale beginning 181 days after the date of this prospectus. Moreover, upon the closing of this offering, shareholders owning an aggregate of up to approximately shares of our common stock will have rights, subject to certain conditions, to require us to file registration statements covering their securities or to include their securities in registration statements that we may file for ourselves or other security holders as described in the "*Description of Capital Stock—Registration Rights*" section of this prospectus. We also intend to file one or more registration statements on Form S-8 under the Securities Act of 1933, as amended ("Securities Act") to register our shares of common stock issued or reserved for issuance under our equity incentive plans. Any such Form S-8 registration statements will automatically become effective upon filing with the SEC. Accordingly, shares of common stock registered under such registration statements will be available for sale in the open market, subject to volume limitations applicable to affiliates, vesting restrictions with us, and the market standoff agreements and lock-up agreements described in the "*Underwriting*" section of this prospectus.

Raising additional capital may cause dilution to our existing shareholders, restrict our operations or require us to relinquish rights to our technologies, products or services.

We may seek additional capital through a combination of public and private equity offerings, debt financings, collaborations and licensing arrangements. To the extent that we raise additional capital through the sale of equity or debt securities, your ownership interest will be diluted and the terms may include other preferences that adversely affect your rights as a shareholder. The incurrence of indebtedness, if obtained, would result in increased fixed payment obligations and could involve restrictive covenants, such as limitations on our ability to incur additional debt, limitations on our ability to acquire or license intellectual property rights and other operating restrictions that could adversely impact our ability to conduct our business. If we raise additional funds through collaborations and alliances and licensing arrangements with third parties or through asset sales, we may have to

relinquish valuable rights to our technologies, products or services, or grant licenses on terms unfavorable to us.

Our management and principal shareholders own a significant percentage of our stock and will be able to exert significant control over matters subject to shareholder approval.

As of March 31, 2019, our executive officers, directors and five percent or greater shareholders and their respective affiliates, beneficially own, in the aggregate, approximately 63.8% of our outstanding common stock on an as converted basis and, upon the closing of this offering, that same group will beneficially own, in the aggregate, approximately % of our outstanding common stock. As a result, after this offering, these shareholders, if they act together, will be able to control the management and affairs of our company and most matters requiring shareholder approval, including the election of directors, amendments of our organizational documents and approval of any merger, sale of substantially all our assets or other significant corporate transactions. This concentration of ownership may prevent or discourage unsolicited acquisition proposals or offers for our common stock that you or other shareholders may feel are in your or their best interest as one of our shareholders.

We will have broad discretion in the use of the net proceeds to us from this offering and may not use them effectively or may allocate them in ways that you and other shareholders may not approve.

Our management will have broad discretion in the application of the net proceeds from this offering, including for any of the purposes described in the "*Use of Proceeds*" section of this prospectus, and you will not have the opportunity as part of your investment decision to assess whether the net proceeds are being used appropriately. Because of the number and variability of factors that will determine our use of the net proceeds from this offering, their ultimate use may vary substantially from their currently intended use. Our management might not apply our net proceeds in ways that ultimately improve our results of operations or increase the value of your investment or in ways that you and other shareholders approve. The failure by our management to apply these funds effectively could result in financial losses that could have a material adverse impact on our business, cause the price of our common stock to decline and delay the development of our products and services. Pending their use, we plan to invest the net proceeds from this offering in short-term, interest-bearing, investment-grade instruments, certificates of deposit or direct or guaranteed obligations of the U.S. government. These investments may not yield a favorable return to our shareholders.

We will incur increased costs as a result of operating as a public company, and our management will be required to devote substantial time to new compliance initiatives. We will be subject to financial reporting and other requirements for which our accounting and other management systems and resources may not be adequately prepared.

As a public company, and particularly after we are no longer an emerging growth company, we will incur significant legal, accounting and other expenses that we did not incur as a private company. In addition, the federal securities laws, including the Sarbanes-Oxley Act, the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, and rules and regulations subsequently implemented by the SEC and The Nasdaq Global Select Market have imposed various requirements on public companies, including requirements to file annual, quarterly, and event driven reports with respect to their business and financial condition, and to establish and maintain effective disclosure and financial controls and corporate governance practices. These rules and regulations will increase our legal and financial compliance costs, make certain activities more time-consuming and costly, and require our management and other personnel to devote a substantial amount of time to compliance initiatives.

Despite our best efforts, we may not be able to produce reliable financial statements or file such financial statements as part of a periodic report in a timely manner with the SEC or comply with The Nasdaq Global Select Market listing requirements. We also expect that these rules and regulations may make it more difficult and more expensive for us to obtain director and officer liability insurance.

Pursuant to Section 404 of the Sarbanes-Oxley Act, we will be required to furnish a report by our management on our internal control over financial reporting, including an attestation report on internal control over financial reporting issued by our independent registered public accounting firm, beginning with the first full year after the closing of this offering. However, while we remain an emerging growth company, we will not be required to include an attestation report on internal control over financial reporting issued by our independent registered public accounting firm. To achieve compliance with Section 404 of the Sarbanes-Oxley Act, we will be engaged in a process to document and evaluate our internal control over financial reporting, which is both costly and challenging. We will need to continue to dedicate internal resources, potentially engage outside consultants, adopt a detailed work plan to assess and document the adequacy of internal control over financial reporting, continue steps to improve control processes as appropriate, validate through testing that controls are functioning as documented and implement a continuous reporting and improvement process for internal control over financial reporting. Despite our efforts, there is a risk that neither we nor our independent registered public accounting firm will be able to conclude within the prescribed timeframe that our internal control over financial reporting is effective as required by Section 404 of the Sarbanes-Oxley Act. This could result in an adverse reaction in the financial markets due to a loss of confidence in the reliability of our financial statements. We could also become subject to investigations by the SEC or other regulatory authorities, which could require additional financial and management resources.

As a public company, we will also be required to maintain disclosure controls and procedures. Disclosure controls and procedures means our controls and other procedures that are designed to ensure that information required to be disclosed by us in the reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the rules and forms of the SEC. We do not expect that our disclosure controls and procedures or our internal control over financial reporting will prevent or detect all errors and all fraud. We believe a control system, no matter how well-designed and operated, can provide only reasonable, not absolute, assurance that the control system's objectives will be met. Due to the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that misstatements due to error or fraud will not occur or that all control issues and instances of fraud, if any, have been detected. The design of any system of controls is based in part on certain assumptions about the likelihood of future events, and any design may not succeed in achieving its stated goals under all potential future conditions. Over time, controls may become inadequate because of changes in conditions or deterioration in the degree of compliance with policies or procedures. Accordingly, because of the inherent limitations in our control system, misstatements due to error or fraud may occur and not be detected.

Provisions in our amended and restated charter documents that will be in effect at the closing of this offering and under Washington law could make an acquisition of our company more difficult and limit attempts by our shareholders to replace or remove our current management.

Our amended and restated articles of incorporation and our amended and restated bylaws, each as will be in effect at the closing of this offering, as well as Washington law contain provisions that may have the effect of deterring takeovers or delaying or preventing a change in control of us or changes in our management that a shareholder might deem to be in his or her best interest. Our amended and restated articles of incorporation and amended and restated bylaws contain provisions that:

- authorize "blank check" preferred stock, which could be issued by our board of directors without shareholder approval and may contain voting, liquidation, dividend and other rights superior to our common stock;

- create a classified board of directors whose members serve staggered three-year terms, with one class being elected each year by our shareholders;
- specify that special meetings of our shareholders can be called only by our board of directors, the Chairperson of our board of directors, our chief executive officer or our president;
- provide that a director may only be removed from the board of directors for cause and then only by the affirmative vote of our shareholders;
- provide that vacancies on our board of directors may be filled only by a majority of directors then in office, even if less than a quorum;
- specify that only our board of directors may change the size of our board of directors;
- establish an advance notice procedure for shareholder proposals to be brought before an annual meeting of our shareholders, including proposed nominations of persons for election to our board of directors;
- specify that no shareholder is permitted to cumulate votes at any election of directors;
- expressly authorize our board of directors to modify, alter or repeal our bylaws; and
- require supermajority votes of the holders of our common stock to amend specified provisions of our amended and restated articles of incorporation and amended and restated bylaws.

These provisions, alone or together, could delay or prevent hostile takeovers and changes in control or changes in our management or our board of directors.

In addition, because we are incorporated in the State of Washington, we are governed by the provisions of Chapter 23B.19 of the Washington Business Corporation Act ("WBCA"), which prohibits certain business combinations between us and certain significant shareholders unless specified conditions are met. These provisions may also have the effect of delaying or preventing a change in control of our company.

Any provision of our amended and restated articles of incorporation or amended and restated bylaws or Washington law that has the effect of delaying or deterring a change in control could limit the opportunity for our shareholders to receive a premium for their shares of our common stock, and could also affect the price that some investors are willing to pay for our common stock.

Our amended and restated articles of incorporation that will be in effect at the closing of this offering will provide that the state courts located in King County, Washington and, to the extent enforceable, the federal district courts of the United States of America will be the exclusive forums for substantially all disputes between us and our shareholders, which could limit our shareholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers, or employees.

Our amended and restated articles of incorporation that will be in effect upon the closing of this offering will provide that, unless we consent in writing to the selection of an alternative forum, the state courts located in King County, Washington (or, if the state courts located within King County, Washington do not have jurisdiction, the federal district court for the Western District of Washington) shall be the sole and exclusive forum for commencing and maintaining any proceeding (i) asserting a claim based on a violation of a duty under the laws of the State of Washington by any of our current or former directors, officers or shareholders in such capacity, (ii) commenced or maintained in the right of our corporation, (iii) asserting a claim arising pursuant to any provision of the WBCA, our amended and restated articles of incorporation or our amended and restated bylaws (as either may be amended from time to time) or (iv) asserting a claim concerning our internal affairs that is not included in clauses

(i) through (iii) above, in all cases to the fullest extent permitted by law and subject to the court having personal jurisdiction over the indispensable parties named as defendants. These provisions would not apply to suits brought to enforce a duty or liability created by the Exchange Act, or any other claim for which the federal courts have exclusive jurisdiction.

Our amended and restated articles of incorporation will provide that the federal district courts of the United States of America will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act, subject to applicable law.

Any person or entity purchasing or otherwise acquiring any interest in any of our securities shall be deemed to have notice of and consented to these provisions. Our exclusive forum provision will not relieve us of our duties to comply with the federal securities laws and the rules and regulations thereunder, and our shareholders will not be deemed to have waived our compliance with these laws, rules and regulations. These exclusive-forum provisions may limit a shareholder's ability to bring a claim in a judicial forum of its choosing for disputes with us or our directors, officers or other employees, which may discourage lawsuits against us and our directors, officers and other employees.

If a court were to find these exclusive-forum provisions in our amended and restated articles of incorporation to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving the dispute in other jurisdictions, which could harm our results of operations. For example, the Court of Chancery of the State of Delaware recently determined that a provision stating that U.S. federal district courts are the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act is not enforceable under Delaware law. It is unclear whether the Delaware Supreme Court will review and ultimately overturn this decision, and whether Washington courts would reach a similar conclusion under Washington law. Even if we are successful in defending against these claims, litigation could result in substantial costs and be a distraction to management and other employees.

Claims for indemnification by our directors and officers may reduce our available funds to satisfy successful third-party claims against us and may reduce the amount of money available to us.

Our amended and restated articles of incorporation that will be in effect at the closing of this offering provide that we will indemnify our directors and officers to the fullest extent permitted by Washington law.

In addition, as permitted by Section 23B.08.510 through Section 23B.08.570 of the WBCA, our amended and restated articles of incorporation and our indemnification agreements that we have entered into with our directors and officers provide that:

- We will indemnify our directors and officers for serving us in those capacities or for serving other business enterprises at our request, to the fullest extent permitted by Washington law. Washington law provides that a corporation may indemnify such person if such person acted in good faith and in a manner such person reasonably believed to be in or not opposed to our best interests and, with respect to any criminal proceeding, had no reasonable cause to believe such person's conduct was unlawful;
- We may, in our discretion, indemnify employees and agents in those circumstances where indemnification is permitted by applicable law;
- We are required to advance expenses, as incurred, to our directors and officers in connection with defending a proceeding, except that such directors or officers shall undertake to repay such advances if it is ultimately determined that such person is not entitled to indemnification;

- The rights conferred in our amended and restated articles of incorporation are not exclusive, and we are authorized to enter into indemnification agreements with our directors, officers, employees and agents and to obtain insurance to indemnify such persons; and
- We may not retroactively amend our amended and restated articles of incorporation provisions to reduce our indemnification obligations to directors, officers, employees and agents.

Because we do not anticipate paying any cash dividends on our capital stock in the foreseeable future, capital appreciation, if any, will be your sole source of gain.

We currently intend to retain all available funds and any future earnings to support operations and to finance the growth and development of our business, and do not anticipate paying any cash dividends on our common stock for the foreseeable future. In addition, the terms of any future debt agreements may preclude us from paying dividends. As a result, capital appreciation, if any, of our common stock will be your sole source of gain for the foreseeable future.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus contains forward-looking statements that are based on management's beliefs and assumptions and on information currently available to management. Some of the statements in the "*Prospectus Summary*," "*Risk Factors*," "*Management's Discussion and Analysis of Financial Condition and Results of Operations*" and "*Business*" sections of this prospectus and elsewhere in this prospectus contain forward-looking statements. In some cases, you can identify forward-looking statements by the following words: "may," "will," "could," "would," "should," "expect," "intend," "plan," "anticipate," "believe," "estimate," "predict," "project," "potential," "continue," "ongoing" or the negative of these terms or other comparable terminology, although not all forward-looking statements contain these words.

These statements involve risks, uncertainties and other factors that may cause actual results, levels of activity, performance or achievements to be materially different from the information expressed or implied by these forward-looking statements. Although we believe we have a reasonable basis for each forward-looking statement contained in this prospectus, we caution you that these statements are based on a combination of facts and factors currently known by us and our projections of the future, about which we cannot be certain. Forward-looking statements in this prospectus include, but are not limited to, statements about:

- the success of our significant investments in our continued research and development of new products and services;
- the success of developing, commercializing and achieving commercial market acceptance of clonoSEQ, immunoSEQ Dx, our TCR-Antigen Map, TCR-based cellular therapies and additional products and services beyond our current portfolio;
- the potential for our identified research priorities to advance our proprietary immune medicine platform or our future products and services;
- the success, cost and timing of our research development activities, preclinical and clinical studies and, in certain instances, clinical trials and clinical validations;
- the potential benefits of collaborations, our ability to enter into collaborations or arrangements, and our ability to attract collaborators with development, manufacturing, regulatory and commercialization expertise;
- the ability and willingness of our collaborators to continue development, manufacturing, distribution and commercialization activities relating to our jointly developed products and services;
- our ability to identify research priorities and apply a risk-mitigated strategy to efficiently discover and develop products and services;
- our ability to obtain and maintain regulatory approval of our products and services;
- our ability, and that of our collaborators, to commercialize our products and services;
- our ability to generate revenue and obtain funding for our operations, including funding necessary to complete further development of our current and future products and services, and if successful, commercialization;
- the size and growth potential of the markets for our products and services, and our ability to serve those markets, either alone or in combination with others;
- the rate and degree of market acceptance of our products and services;
- our financial performance;

- the pricing and reimbursement of our products and services following approval where required;
- our expectations regarding our ability to obtain and maintain intellectual property protection for our immune medicine platform, products, services and related technologies and the direction of such protection;
- regulatory developments in the United States and foreign countries;
- the success of competing products or services that are or may become available;
- developments relating to our competitors and our industry;
- our ability to attract and retain key scientific or management personnel;
- the impact of laws and regulations;
- our estimates regarding expenses, future revenue, capital requirements and needs for additional financing; and
- our use of the proceeds from this offering.

In addition, you should refer to the "*Risk Factors*" section of this prospectus for a discussion of other important factors that may cause actual results to differ materially from those expressed or implied by the forward-looking statements. As a result of these factors, we cannot assure you that the forward-looking statements in this prospectus will prove to be accurate. Furthermore, if the forward-looking statements prove to be inaccurate, the inaccuracy may be material. In light of the significant uncertainties in these forward-looking statements, you should not regard these statements as a representation or warranty by us or any other person that we will achieve our objectives and plans in any specified time frame, or at all. The forward-looking statements in this prospectus represent our views as of the date of this prospectus. We anticipate that subsequent events and developments will cause our views to change. However, while we may elect to update these forward-looking statements at some point in the future, we have no current intention of doing so except to the extent required by applicable law. You should, therefore, not rely on these forward-looking statements as representing our views as of any date subsequent to the date of this prospectus.

MARKET AND INDUSTRY DATA

This prospectus contains estimates, projections and other information concerning our industry and our business, as well as data regarding market size, estimates and forecasts prepared by our management. Information that is based on estimates, forecasts, projections, market research or similar methodologies is inherently subject to uncertainties and actual events or circumstances may differ materially from events and circumstances that are assumed in this information. Unless otherwise expressly stated, we obtained this industry, business, market and other data from reports, research surveys, studies and similar data prepared by market research firms and other third parties, industry, medical and general publications, government data and similar sources. In some cases, we do not expressly refer to the sources from which these data are derived. In that regard, when we refer to one or more sources of this type of data in any paragraph, you should assume that other data of this type appearing in the same paragraph is derived from the same sources, unless otherwise expressly stated or the context otherwise requires.

USE OF PROCEEDS

We estimate that the net proceeds from this offering will be approximately $ million, or $ million if the underwriters exercise in full their option to purchase additional shares of our common stock, assuming an initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, after deducting the estimated underwriting discounts and commissions and estimated offering expenses.

Each $1.00 increase (decrease) in the assumed initial public offering price of $ per share of common stock, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the net proceeds to us by approximately $ million, assuming that the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting the estimated underwriting discounts and commissions. We may also increase or decrease the number of shares we are offering. Each increase (decrease) of 1,000,000 shares in the number of shares of common stock offered by us would increase (decrease) the net proceeds to us by approximately $ million, assuming that the assumed initial public offering price remains the same, and after deducting the estimated underwriting discounts and commissions.

The principal purposes of this offering are to increase our financial flexibility, obtain additional capital to support our operations, create a public market for our common stock and to facilitate our potential future access to the public equity markets. We expect to use the net proceeds from this offering as follows:

- $ million to $ million to fund commercial and marketing activities associated with our clinical products and services;
- $ million to $ million to fund continued research and development for our drug discovery initiatives; and
- $ million to $ million to fund ongoing investments in our TCR-Antigen Map related activities.

We expect to use the remainder, if any, to scale our laboratory operations with our anticipated growth, for working capital and for other general corporate purposes.

We currently believe the net proceeds from this offering will allow us to develop clonoSEQ for CLL and NHL through FDA authorization and reimbursement, immunoSEQ Dx for a selected indication into clinical validation, and one of our TCR-based cell therapies through IND submission. We believe our cash flows from operations and our existing cash, cash equivalents and marketable securities, together with the net proceeds from this offering, will be sufficient to fund our operating expenses and capital expenditure requirements through at least the 24 months following the date of this prospectus.

The estimated use of proceeds is preliminary and subject to change. We cannot specify with certainty all of the particular uses for the net proceeds to be received upon the closing of this offering. Due to uncertainties inherent in the development process, it is difficult to estimate the exact amounts of the net proceeds that will be used for any particular purpose. We may use our existing cash, cash equivalents, marketable securities and the future payments, if any, generated from any future collaboration agreements to fund our operations, either of which may alter the amount of net proceeds used for a particular purpose. In addition, the amount, allocation and timing of our actual expenditures will depend upon numerous factors, including the results of our research and development efforts, the timing and success of our Genentech and Microsoft collaborations and the timing of regulatory submissions. Accordingly, we will have broad discretion in using these proceeds.

Pending their use, we plan to invest the net proceeds from this offering in short-term, interest-bearing, investment-grade instruments, certificates of deposit or direct or guaranteed obligations of the U.S. government.

DIVIDEND POLICY

We currently intend to retain all available funds and any future earnings to fund the growth and development of our business. We do not intend to pay cash dividends to our shareholders in the foreseeable future. Any future determination to declare dividends will be made at the discretion of our board of directors and will depend on our financial condition, operating results, capital requirements, general business conditions and other factors that our board of directors may deem relevant. Our future ability to pay cash dividends on our common stock may also be limited by the terms of any future debt securities, preferred stock or credit facility.

CAPITALIZATION

The following table sets forth our capitalization as of March 31, 2019:

- on an actual basis;
- on a pro forma basis to reflect: (i) the conversion of all outstanding shares of our convertible preferred stock into an aggregate of 93,023,694 shares of common stock upon the closing of this offering; (ii) the issuance of 20,000 shares of common stock upon the exercise of an outstanding warrant to purchase our common stock immediately prior to the closing of this offering that would otherwise expire; (iii) the conversion of an outstanding warrant to purchase our convertible preferred stock into a warrant to purchase an aggregate of 56,875 shares of our common stock upon the closing of this offering; and (iv) the filing and effectiveness of our amended and restated articles of incorporation upon the closing of this offering; and
- on a pro forma as adjusted basis to give further effect to the issuance and sale of shares of common stock in this offering at an assumed initial public offering price of $ per share of common stock, the midpoint of the price range set forth on the cover page of this prospectus, and after deducting the estimated underwriting discounts and commissions and estimated offering expenses.

The pro forma as adjusted information below is illustrative only and our capitalization following the closing of this offering will be adjusted based on the actual initial public offering price and other terms of this offering determined at pricing. You should read this information together with our financial statements and related notes appearing elsewhere in this prospectus and the information set forth in the "*Use of Proceeds*," "*Selected Financial Data*" and "*Management's Discussion and Analysis of Financial Condition and Results of Operations*" sections of this prospectus.

	As of March 31, 2019		
	Actual	Pro Forma	Pro Forma As Adjusted[1]
	(unaudited) (in thousands, except for share and per share amounts)		
Cash, cash equivalents and marketable securities	$ 440,431	$ 440,440	$
Convertible preferred stock warrant liability	$ 353	$ —	$
Convertible preferred stock, $0.0001 par value per share; 93,762,517 shares authorized, 93,023,694 issued and outstanding, actual; no shares authorized, issued or outstanding, pro forma and pro forma as adjusted	561,210	—	
Shareholders' (deficit) equity:			
Preferred stock, $0.0001 par value per share; no shares authorized, issued or outstanding, actual; shares authorized, no shares issued or outstanding, pro forma and pro forma as adjusted	—	—	
Common stock, $0.0001 par value per share; 131,000,000 shares authorized, 12,930,536 shares issued and outstanding, actual; authorized, pro forma and pro forma as adjusted, 105,974,230 issued and outstanding, pro forma; shares issued and outstanding, pro forma as adjusted	1	11	
Additional paid-in capital	40,981	602,543	
Accumulated other comprehensive loss	92	92	
Accumulated deficit	(314,548)	(314,548)	
Total shareholders' (deficit) equity	(273,474)	288,098	
Total capitalization	$(288,089)	$ 288,098	$

(1) Each $1.00 increase (decrease) in the assumed initial public offering price of $ per share of common stock, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) our pro forma as adjusted cash, cash equivalents and marketable securities by approximately $ million, and our pro forma as adjusted amount of additional paid-in capital, total shareholders' (deficit) equity and total capitalization by approximately $ million, assuming that the number of common stock offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting the estimated underwriting discounts and commissions. We may also increase or decrease the number of shares we are offering. Each increase (decrease) of 1,000,000 shares in the number of shares of common stock offered by us would increase (decrease) our pro forma as adjusted cash, cash equivalents and marketable securities, additional paid-in capital, total shareholders' (deficit) equity and total capitalization by approximately $ million, assuming that the assumed initial price to the public remains the same, and after deducting the estimated underwriting discounts and commissions. The pro forma as adjusted information discussed above is illustrative only and will be adjusted based on the actual public offering price and other terms of this offering determined at pricing.

If the underwriters exercise their option to purchase additional shares in full, pro forma as adjusted cash, cash equivalents and marketable securities, additional paid-in capital, total shareholders' (deficit) equity, total capitalization and shares of common stock outstanding as of March 31, 2019 would be $, $, $, $ and shares, respectively.

The total number of shares of our common stock reflected in our actual, pro forma and pro forma as adjusted information set forth in the table above excludes:

- 56,875 shares of common stock issuable upon the exercise of a warrant to purchase shares of convertible preferred stock outstanding as of March 31, 2019, with an exercise price of $2.64 per share;
- 35,032 shares of common stock issuable upon the exercise of a warrant to purchase shares of common stock outstanding as of March 31, 2019, with an exercise price of $0.33 per share;
- 31,077 shares of common stock issuable upon the exercise of stock options to purchase shares of convertible preferred stock outstanding as of March 31, 2019 under our Sequenta Plan with a weighted-average exercise price of $0.60 per share;
- 16,851,722 shares of common stock issuable upon the exercise of stock options outstanding as of March 31, 2019 under our 2009 Plan with a weighted-average exercise price of $4.95 per share, and 1,657,181 shares of common stock issuable upon the exercise of stock options issued after March 31, 2019, under our 2009 Plan, with a weighted-average exercise price of $7.80 per share;
- shares of common stock that will become available for future issuance under the 2019 Plan (which includes all shares reserved for issuance under our 2009 Plan) upon the effectiveness of the registration statement of which this prospectus forms a part; and
- shares of common stock that will become available for future issuance under our ESPP upon the effectiveness of the registration statement of which this prospectus forms a part.

DILUTION

If you invest in our common stock in this offering, your ownership interest will be immediately diluted to the extent of the difference between the initial public offering price per share and the pro forma as adjusted net tangible book value per share of our common stock immediately after this offering.

Our historical net tangible book value as of March 31, 2019 was a deficit of $405.7 million, or a deficit of $31.37 per share of our common stock. Our historical net tangible book value is the amount of our total tangible assets less our total liabilities. Historical net tangible book value per share represents historical net tangible book value divided by the 12,930,536 shares of our common stock outstanding as of March 31, 2019.

Our pro forma net tangible book value as of March 31, 2019 was $155.9 million, or $1.47 per share of our common stock. Pro forma net tangible book value per share represents historical net tangible book value divided by the number of shares of our common stock outstanding as of March 31, 2019, after giving effect to: (i) the conversion of all outstanding shares of our convertible preferred stock into an aggregate of 93,023,694 shares of common stock upon the closing of this offering; (ii) the issuance of 20,000 shares of common stock upon the exercise of an outstanding warrant to purchase our common stock immediately prior to the closing of this offering that would otherwise expire; and (iii) the conversion of an outstanding warrant to purchase our convertible preferred stock into a warrant to purchase an aggregate of 56,875 shares of our common stock upon the closing of this offering.

After giving further effect to the sale by us of shares of common stock in this offering at an assumed initial public price of $ per share, the midpoint of the estimated price range set forth on the cover page of this prospectus, and after deducting the estimated underwriting discounts and commissions and estimated offering expenses, our pro forma as adjusted net tangible book value as of March 31, 2019 would have been approximately $, or $ per share. This amount represents an immediate increase in pro forma as adjusted net tangible book value of $ per share to our existing shareholders and an immediate dilution of $ per share to new investors participating in this offering.

We determine dilution per share to investors participating in this offering by subtracting pro forma as adjusted net tangible book value per share after this offering from the assumed initial public offering price per share paid by investors participating in this offering. The following table illustrates this dilution (unaudited):

Assumed initial public offering price per share		$
Historical net tangible book deficit per share as of March 31, 2019	$ (31.37)	
Pro forma increase in net tangible book value per share	32.84	
Pro forma net tangible book value per share as of March 31, 2019	1.47	
Increase in pro forma net tangible book value per share attributable to new investors participating in this offering		
Pro forma as adjusted net tangible book value per share after this offering		
Dilution per share to new investors participating in this offering		$

Each $1.00 increase (decrease) in the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the pro forma as adjusted net tangible book value by $ per share and increase (decrease) the dilution per share to new investors by $ per share, assuming the number of shares of common stock offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting the estimated underwriting discounts and commissions.

Similarly, each increase (decrease) of 1,000,000 shares in the number of common stock we are offering would increase (decrease) our pro forma as adjusted net tangible book value by approximately $ million, or $ per share, and decrease (increase) the dilution per share to new investors participating in this offering by $ per share, assuming that the assumed initial public offering price of $, the midpoint of the estimated price range set forth on the cover page of this prospectus, remains the same, and after deducting the estimated underwriting discounts and commissions.

The pro forma as adjusted information discussed above is illustrative only and will change based on the actual initial public offering price, number of shares and other terms of this offering determined at pricing.

If the underwriters exercise their option to purchase additional shares in this offering in full at the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, and assuming the number of shares of common stock offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions and estimated offering expenses, the pro forma as adjusted net tangible book value would be approximately $ per share, and the dilution in pro forma net tangible book value per share to investors in this offering would be approximately $ per share.

The table below summarizes, as of March 31, 2019, on a pro forma as adjusted basis, the number of shares of common stock purchased from us, the total consideration and the average price per share (i) paid to us by our existing shareholders and (ii) to be paid by new investors participating in this offering at an assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, before deducting estimated underwriting discounts and commissions and estimated offering expenses.

	Shares Purchased		Total Consideration		Average Price Per Share
	Number	Percent	Amount	Percent	
Existing shareholders		%	$	%	$
Investors in this offering					
Total		100.0%		100.0%	

In addition, if the underwriters exercise their option to purchase additional shares in full, the number of shares held by existing shareholders will be reduced to % of the total number of shares of common stock to be outstanding upon the closing of this offering, and the number of shares of common stock held by new investors participating in this offering will be further increased to , or % of the total number of shares of common stock to be outstanding upon the closing of this offering.

Each $1.00 increase (decrease) in the assumed initial public offering price of $ per share, the midpoint of the estimated price range set forth on the cover page of this prospectus, would increase (decrease) total consideration paid by new investors by $ million, assuming the number of shares of common stock we are offering, as set forth on the cover page of this prospectus, remains the same, after deducting the estimated underwriting discounts and commissions. Each increase (decrease) of 1,000,000 in the number of shares of common stock offered by us would increase (decrease) total consideration paid by new investors by $ million, assuming that the assumed initial public offering price of $, the midpoint of the estimated price range set forth on the cover page of this prospectus, remains the same, and after deducting the estimated underwriting discounts and commissions.

The above discussion and tables are based on shares of common stock issued and outstanding as of March 31, 2019 and (i) includes the conversion of all outstanding shares of our convertible preferred stock into an aggregate of 93,023,694 shares of our common stock upon the closing of this offering and the issuance of 20,000 shares of common stock upon exercise of an outstanding common stock warrant immediately prior to the closing of this offering and (ii) excludes:

- 56,875 shares of common stock issuable upon the exercise of a warrant to purchase shares of convertible preferred stock outstanding as of March 31, 2019, with an exercise price of $2.64 per share;
- 35,032 shares of common stock issuable upon the exercise of a warrant to purchase shares of common stock outstanding as of March 31, 2019, with an exercise price of $0.33 per share;
- 31,077 shares of common stock issuable upon the exercise of stock options to purchase shares of convertible preferred stock outstanding as of March 31, 2019 under our Sequenta Plan with a weighted-average exercise price of $0.60 per share;
- 16,851,722 shares of common stock issuable upon the exercise of stock options outstanding as of March 31, 2019 under our 2009 Plan with a weighted-average exercise price of $4.95 per share, and 1,657,181 shares of common stock issuable upon the exercise of stock options issued after March 31, 2019, under our 2009 Plan, with a weighted-average exercise price of $7.80 per share;
- shares of common stock that will become available for future issuance under the 2019 Plan (which includes all shares reserved for issuance under our 2009 Plan) upon the effectiveness of the registration statement of which this prospectus forms a part; and
- shares of common stock that will become available for future issuance under our ESPP upon the effectiveness of the registration statement of which this prospectus forms a part.

To the extent that outstanding stock options or warrants are exercised, new stock options or warrants are issued or we issue additional shares of common stock in the future, there will be further dilution to new investors. If all of these outstanding warrants and options to purchase shares as of March 31, 2019 were exercised, our pro forma as adjusted net tangible book value would be $ per share, representing an immediate increase in pro forma as adjusted net tangible book value of $ per share to our existing shareholders and an immediate dilution of $ per share to new investors participating in this offering.

In addition, we may choose to raise additional capital because of market conditions or strategic considerations, even if we believe we have sufficient funds for our current or future operating plans. If we raise additional capital through the sale of equity or convertible debt securities, the issuance of these securities could result in further dilution to our shareholders.

SELECTED FINANCIAL DATA

The selected financial data set forth below should be read together with our financial statements and the related notes to those statements, as well as the "*Management's Discussion and Analysis of Financial Condition and Results of Operations*" section of this prospectus. The statements of operations data for the years ended December 31, 2017 and 2018 and the balance sheet data as of December 31, 2017 and 2018 have been derived from our audited financial statements included elsewhere in this prospectus. The statements of operations data for the three months ended March 31, 2018 and 2019 and the balance sheet data as of March 31, 2019 have been derived from our unaudited condensed financial statements included elsewhere in this prospectus, which have been prepared on the same basis as our audited financial statements. In the opinion of management, our unaudited condensed financial statements reflect all adjustments, consisting only of normal recurring adjustments, necessary for a fair statement of the financial information in those statements. Our historical results are not necessarily indicative of the results that may be expected in the future, and the results for the three months ended March 31, 2019 are not necessarily indicative of results to be expected for the full year ending December 31, 2019 or any other period.

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
	(in thousands, except share and per share data)			
Statements of Operations Data				
Revenue				
Sequencing revenue	$ 22,759	$ 32,978	$ 5,780	$ 6,083
Development revenue	15,689	22,685	3,935	6,583
Total revenue	38,448	55,663	9,715	12,666
Operating expenses				
Cost of revenue	15,680	19,668	3,989	4,988
Research and development	31,995	39,157	8,855	12,483
Sales and marketing	16,765	24,486	5,047	7,817
General and administrative	15,949	20,409	4,543	7,004
Amortization of intangible assets	1,694	1,699	419	419
Restructuring	840	—	—	—
Total operating expenses	82,923	105,419	22,853	32,711
Loss from operations	(44,475)	(49,756)	(13,138)	(20,045)
Interest and other income, net	1,644	3,309	747	1,659
Net loss	(42,831)	(46,447)	(12,391)	(18,386)
Fair value adjustment to Series E-1 convertible preferred stock options	135	102	4	(254)
Net loss attributable to common shareholders	$ (42,696)	$ (46,345)	$ (12,387)	$ (18,640)
Net loss per share attributable to common shareholders, basic and diluted	$ (3.50)	$ (3.67)	$ (1.01)	$ (1.45)
Weighted-average shares used in computing net loss per share attributable to common shareholders, basic and diluted	12,196,998	12,629,778	12,292,563	12,886,087
Unaudited pro forma net loss per share attributable to common shareholders, basic and diluted[1]		$ (0.44)		$ (0.18)
Unaudited weighted-average shares used in computing pro forma net loss per share attributable to common shareholders, basic and diluted[1]		105,433,645		105,880,665
Other Financial and Operating Data (unaudited):				
Adjusted EBITDA[2]	$ (30,830)	$ (32,607)	$ (8,585)	$ (15,216)

(1) See Note 17 to our audited financial statements and Note 12 to our unaudited condensed financial statements appearing at the end of this prospectus for details on the calculation of basic and diluted net loss per share and the calculation of basic and diluted pro forma net loss per share.

(2) Adjusted EBITDA is a non-GAAP financial measure that we define as net loss adjusted for interest and other income, net, income tax benefit (expense), depreciation and amortization, restructuring charges and share-based compensation expenses.

Management uses Adjusted EBITDA to evaluate the financial performance of our business and the effectiveness of our business strategies. We present Adjusted EBITDA because we believe it is frequently used by analysts, investors and other interested parties to evaluate companies in our industry and it facilitates comparisons on a consistent basis across reporting periods. Further, we believe it is helpful in highlighting trends in our operating results because it excludes items that are not indicative of our core operating performance.

Adjusted EBITDA has limitations as an analytical tool and you should not consider it in isolation, or as a substitute for analysis of our results as reported under GAAP. We may in the future incur expenses similar to the adjustments in the presentation of Adjusted EBITDA. In particular, we expect to incur meaningful share-based compensation expense in the future. Other limitations include that Adjusted EBITDA does not reflect:

- all expenditures or future requirements for capital expenditures or contractual commitments;
- changes in our working capital needs;
- income tax expense (benefit), which may be a necessary element of our costs and ability to operate;
- the costs of replacing the assets being depreciated and amortized, which will often have to be replaced in the future;
- the non-cash component of employee compensation expense; and
- the impact of earnings or charges resulting from matters we consider not to be reflective, on a recurring basis, of our ongoing operations.

In addition, Adjusted EBITDA may not be comparable to similarly titled measures used by other companies in our industry or across different industries.

The following is a reconciliation of our net income (loss) to Adjusted EBITDA:

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
	(in thousands)			
Net loss	$ (42,831)	$ (46,447)	$ (12,391)	$ (18,386)
Interest and other income, net	(1,644)	(3,309)	(747)	(1,659)
Income tax (benefit) expense	—	—	—	—
Depreciation and amortization expense	5,796	6,000	1,451	1,783
Restructuring[a]	840	—	—	—
Share-based compensation expense[b]	7,009	11,149	3,102	3,046
Adjusted EBITDA	$ (30,830)	$ (32,607)	$ (8,585)	$ (15,216)

(a) Represents gains and losses recognized in conjunction with restructuring activities. See Note 14 to our audited financial statements appearing at the end of this prospectus for details on our restructuring charges.

(b) Represents share-based compensation expense related to option awards. See Note 13 to our audited financial statements and Note 11 to our unaudited condensed financial statements appearing at the end of this prospectus for details on our share-based compensation expense.

	As of December 31,		As of March 31,
	2017	2018	2019
			(unaudited)
	(in thousands)		
Balance Sheet Data:			
Cash, cash equivalents and marketable securities	$ 201,055	$ 165,018	$ 440,431
Working capital[1]	184,244	157,918	395,888
Total assets	362,489	332,688	614,575
Total liabilities	25,772	29,942	326,839
Convertible preferred stock	561,333	560,858	561,210
Total shareholders' (deficit) equity	(224,616)	(258,112)	(273,474)

(1) We define working capital as current assets less current liabilities.

MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

You should read the following discussion and analysis of our financial condition and results of operations together with our financial statements and related notes and other financial information appearing elsewhere in this prospectus. Some of the information contained in this discussion and analysis or set forth elsewhere in this prospectus, including information with respect to our plans and strategy for our business and related financing, includes forward-looking statements that involve risks and uncertainties. As a result of many factors, including those factors set forth in the "Risk Factors" section of this prospectus, our actual results could differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis.

Overview

We are advancing the field of immune-driven medicine by harnessing the inherent biology of the adaptive immune system to transform the diagnosis and treatment of disease. Our immune medicine platform applies our proprietary technologies to read the diverse genetic code of a patient's immune system and understand precisely how it detects and treats disease in that patient. We capture these insights in our dynamic clinical immunomics database, which is underpinned by computational biology and machine learning, and use them to develop and commercialize clinical products and services that we are tailoring to each individual patient. We have two commercial products and services and a robust pipeline of clinical products and services that we are designing to diagnose, monitor and enable the treatment of diseases such as cancer, autoimmune conditions and infectious diseases.

Our immune medicine platform is the foundation for our expanding suite of products and services. The cornerstone of our platform and core immunosequencing product, immunoSEQ, serves as our underlying research and development engine and generates revenue from academic and biopharmaceutical customers. Our first clinical diagnostic product, clonoSEQ, is the first test authorized by the FDA for the detection and monitoring of MRD in patients with MM and ALL and is being validated for patients with other blood cancers. Leveraging our collaboration with Microsoft to create the TCR-Antigen Map, we are also developing a diagnostic product, immunoSEQ Dx, that may enable early detection of many diseases from a single blood test. Our therapeutic product candidates, being developed under the Genentech Agreement, leverage our platform to identify specific immune cells to develop into cellular therapies in oncology.

Since our inception, we have devoted a majority of our resources to research and development activities to develop our immune medicine platform, which enables the delivery of our products and services for life sciences research, clinical diagnostics and drug discovery customers.

For our life science research customers, we provide two categories of products and services using immunoSEQ, our core sequencing and immunomics tracking technology. First, we provide immunosequencing services, the revenue from which we record as sequencing revenue. Second, we provide certain research customers professional support, for which we may receive payments upon those customers achieving specified milestones. We record these support activities as development revenue.

For our clinical diagnostics customers, we sell our clonoSEQ diagnostic tests, which include our immunosequencing services and are thus recorded as sequencing revenue. In the future we intend to sell other diagnostics products and services, which we also expect to record as sequencing revenue.

For our current drug discovery collaborator, Genentech, we screen, identify and characterize TCRs in support of our collaboration. We plan to record revenue from this collaboration as development revenue.

Historically, we have sold immunoSEQ as a fee-for-service offering to academic centers and biopharmaceutical customers and further deepened those relationships over time by supporting their development initiatives. These research offerings have comprised the vast majority of our revenue to date, although our business is pursuing broader opportunities. As we continue to expand the use of our clonoSEQ diagnostic tests, develop and commercialize immunoSEQ Dx, and develop and commercialize therapeutic product candidates with our drug discovery collaborator, we expect our mix of revenue to shift to clinical products and services, which we believe will become our largest sources of revenue.

We are actively pursuing opportunities to deepen our relationships with current customers and initiate relationships with new customers. We have an experienced, specialty salesforce that is targeting department heads, laboratory directors, principal investigators, core facility directors, clinicians, payors and research scientists and pathologists at leading academic institutions, biopharmaceutical companies, research institutions and contract research organizations. We plan to continue to expand our life sciences research and clinical diagnostic revenue sources beyond the more than 2,000 academic researchers, 125 biopharmaceutical companies and 480 clinical trials that have used our technology for research purposes to date. As MRD assessment becomes standard practice for patient management across a range of blood cancers, we believe it will be essential for clinicians and patients to have access to a highly accurate, sensitive and standardized MRD assessment tool. We are focused on establishing and maintaining collaborative relationships with payors, developing health economic evidence and building billing and patient access infrastructure to expand reimbursement coverage for our clinical diagnostics.

We generated revenue of $38.4 million and $55.7 million for the years ended December 31, 2017 and 2018, respectively, and $9.7 million and $12.7 million for the three months ended March 31, 2018 and 2019, respectively. Our net losses were $42.8 million and $46.4 million for the years ended December 31, 2017 and 2018, respectively, and $12.4 million and $18.4 million for the three months ended March 31, 2018 and 2019, respectively. We have funded our operations to date principally from the sale of convertible preferred stock, and to a lesser extent sequencing and development revenue. As of December 31, 2018 and March 31, 2019, we had cash, cash equivalents and marketable securities of $165.0 million and $440.4 million, respectively. In December 2018, we entered into the Genentech Agreement pursuant to which we received a $300.0 million initial upfront payment in February 2019, may be eligible to receive approximately $1.8 billion over time, including payments upon achievement of specified development, regulatory and commercial milestones and may receive additional royalties on sales of products commercialized under this agreement.

Components of Results of Operations

Revenue

We derive our revenue from two sources: (i) sequencing revenue and (ii) development revenue.

Sequencing revenue. Sequencing revenue reflects the amounts generated from providing sequencing services through immunoSEQ to research customers and from providing testing services through clonoSEQ to clinical and research customers.

For our research customers, which include biopharmaceutical customers and academic institutions, delivery of the sequencing results may include some level of professional support and analysis. Terms with biopharmaceutical customers generally include non-refundable upfront payments, which we record as deferred revenue. For all customers, we recognize revenue as we deliver sequencing results. From time to time, we offer discounts in order to gain rights and access to certain

datasets. Revenue is recognized net of these discounts and costs associated with these services are reflected in cost of revenue.

For our clinical customers, we derive revenue from providing our clonoSEQ test report to ordering physicians. We bill commercial payors and medical institutions as we deliver test results to ordering physicians. Amounts paid for clonoSEQ diagnostic tests by commercial payors and medical institutions vary based on respective reimbursement rates and patient responsibilities, which may vary from our targeted list price. To date, the majority of our clonoSEQ diagnostic test revenue has been received from medical institutions. We recognize clinical revenue by evaluating customer payment history and estimating the amount of revenue that is collectible. As of December 31, 2018, we did not have reimbursement available to us through any government payors for clonoSEQ.

In January 2019, clonoSEQ received Medicare coverage aligned with the FDA label and NCCN guidelines for longitudinal monitoring in MM and ALL. We bill Medicare for an episode of treatment when we deliver the first eligible test results. This billing contemplates all necessary tests required during a patient's treatment cycle, which is currently estimated at approximately four tests per patient, including the initial sequence identification test. Revenue is recognized at the time the initial billable test result is delivered and is based upon cumulative tests delivered to date. Any unrecognized revenue from the initial billable test is recorded as deferred revenue, and is recognized as we deliver the remaining tests in a patient's treatment cycle.

Development revenue. Development revenue primarily represents regulatory or development support services, other than sequencing revenue, that we provide to biopharmaceutical customers who seek access to our platform to support their therapeutic development activities. Additionally, we generate development revenue from the achievement of regulatory milestones. We enter into collaboration and similar agreements with these customers. When these agreements include sequencing activities, we separately classify those activities as sequencing revenue. These agreements may also include substantial non-refundable upfront payments which we recognize as development revenue over time as we perform the respective services.

We expect revenue to increase over the long term, particularly as the mix of revenue migrates to clinical diagnostics and drug discovery. The pace by which this mix migrates will be determined by the level of customer adoption and frequency of use of our products and services. However, our revenue may fluctuate from period to period due to the uncertain nature of delivery of our product and services and milestone achievement.

Cost of Revenue

Cost of revenue includes the cost of materials, personnel-related expenses (comprised of salaries, benefits and share-based compensation), shipping and handling, equipment and allocated facility costs associated with processing samples and professional support for our sequencing revenue. Allocated facility costs include depreciation of laboratory equipment, allocated facility occupancy and information technology costs. Costs associated with processing samples are recorded as expense, regardless of the timing of revenue recognition. As such, cost of revenue and related volume does not always trend in the same direction as revenue recognition and related volume.

We expect cost of revenue to increase in absolute dollars as we grow our sequencing volume but the cost per sample to decrease over the long term due to the efficiencies we may gain as sequencing volume increases from improved utilization of our laboratory capacity, automation and other value engineering initiatives.

Research and Development Expenses

Research and development expenses comprise laboratory materials costs, personnel-related expenses, allocated facility costs, information technology and contract service expenses. Research and development activities support further development and refinement of existing assays and products, discovery of new technologies and investments into our immune medicine platform. We also include in research and development expenses the costs associated with software development activities to support laboratory scaling and workflow, as well as development of applications to support future commercial opportunities. We are currently conducting research and development activities for several products and services, and we typically use our laboratory materials, personnel, facilities, information technology and other development resources across multiple development programs. Additionally, certain of these research and development activities benefit more than one of our product opportunities. We do not track research and development expenses by specific product candidates.

A component of our research and development activities is supporting clinical and analytical validations to obtain regulatory approval for future clinical products and services. Some of these activities have generated and may in the future generate development revenue.

We expect our research and development expenses to continue to increase in absolute dollars as we innovate and expand the application of our platform. However, we expect research and development expenses to decrease as a percentage of revenue in the long term, and may fluctuate as a percentage of revenue from period to period due to the timing and extent of our efforts needed to develop and commercialize new products and services.

Sales and Marketing Expenses

Sales and marketing expenses consist primarily of personnel-related expenses for commercial sales, account management, marketing, reimbursement, medical education and business development personnel that support commercialization of our platform products. In addition, these expenses include external costs such as advertising expenses, customer education and promotional expenses, market analysis expenses, conference fees, travel expenses and allocated facility costs.

We expect our sales and marketing expenses to increase in absolute dollars as we expand our commercial sales, marketing and business development teams, and increase marketing activities to drive awareness and adoption of our products and services. However, we expect sales and marketing expenses to decrease as a percentage of revenue in the long term, though they may fluctuate as a percentage of revenue from period to period due to the timing and magnitude of these expenses.

General and Administrative Expenses

General and administrative expenses consist primarily of personnel-related expenses, including share-based compensation, salaries and benefits for our personnel in executive, legal, finance and accounting, human resources and other administrative functions, including third-party billing services. In addition, these expenses include external legal costs, accounting and tax service expenses, consulting fees and allocated facilities costs.

We expect our general and administrative expenses to continue to increase in absolute dollars as we increase headcount and incur costs associated with operating as a public company, including expenses related to legal, accounting, regulatory, maintaining compliance with exchange listing and requirements of the SEC, director and officer insurance premiums and investor relations. Though expected to increase in absolute dollars, we expect these expenses to decrease as a percentage of revenue in the long term.

Comparison of the Years Ended December 31, 2017 and 2018

	Year Ended December 31,	
	2017	2018
	(in thousands)	
Revenue		
Sequencing revenue	$ 22,759	$ 32,978
Development revenue	15,689	22,685
Total revenue	38,448	55,663
Operating expenses		
Cost of revenue	15,680	19,668
Research and development	31,995	39,157
Sales and marketing	16,765	24,486
General and administrative	15,949	20,409
Amortization of intangible assets	1,694	1,699
Restructuring	840	—
Total operating expenses	82,923	105,419
Loss from operations	(44,475)	(49,756)
Interest and other income, net	1,644	3,309
Net loss	(42,831)	(46,447)
Fair value adjustment to Series E-1 convertible preferred stock options	135	102
Net loss attributable to common shareholders	$(42,696)	$ (46,345)

Revenue

(in thousands, except percentages)	Year Ended December 31,		Change		Percent of Revenue	
	2017	2018	$	%	2017	2018
Revenue						
Sequencing revenue	$22,759	$32,978	$10,219	45%	59%	59%
Development revenue	15,689	22,685	6,996	45	41	41
Total revenue	$38,448	$55,663	$17,215	45%	100%	100%

Total revenue was $55.7 million for the year ended December 31, 2018 compared to $38.4 million for the year ended December 31, 2017, representing an increase of $17.2 million, or 45%.

Sequencing revenue increased to $33.0 million for the year ended December 31, 2018, representing an increase of $10.2 million, or 45%. The increase in sequencing revenue was primarily attributable to a change in our sequencing revenue mix to higher priced products and services, particularly from biopharmaceutical customers utilizing clonoSEQ for research purposes. In 2018, we recognized $3.4 million in revenue related to cancelled customer projects that were previously deferred.

Research sequencing volume increased by 4% to 30,200 sequences delivered in 2018 from 29,106 sequences delivered in 2017. Additionally, clinical revenue also increased primarily due to more tests delivered to medical institutions with higher reimbursement rates, as well as increased volumes. Clinical sequencing volume increased by 32% to 6,867 clinical tests in 2018 from 5,220 clinical tests in 2017.

Development revenue increased to $22.7 million for the year ended December 31, 2018, representing an increase of $7.0 million, or 45%. The increase was primarily attributable to the achievement of regulatory milestones of $10.0 million related to our biopharmaceutical MRD development projects utilizing clonoSEQ, offset by a $3.0 million decrease relating to support services for FDA submissions of clonoSEQ that occurred in 2017.

Cost of Revenue

	Year Ended December 31,		Change		Percent of Revenue	
(In thousands, except percentages)	2017	2018	$	%	2017	2018
Cost of revenue	$15,680	$19,668	$3,988	25%	41%	35%

Cost of revenue was $19.7 million for the year ended December 31, 2018, compared to $15.7 million for the year ended December 31, 2017, representing an increase of $4.0 million, or 25%. The increase in cost of revenue was primarily attributable to an increase of $2.6 million in the cost of processing our samples as a result of expanding our production laboratory overhead and increased sample volumes. In addition, materials costs increased by $1.1 million, reflecting increases in samples processed year over year and a change in our mix of revenue to our higher-cost clonoSEQ tests.

Research and Development

	Year Ended December 31,		Change		Percent of Revenue	
(in thousands, except percentages)	2017	2018	$	%	2017	2018
Research and development	$31,995	$39,157	$7,162	22%	83%	70%

The following table presents disaggregated research and development expenses by cost classification for the periods presented:

	Year Ended December 31,		
(in thousands)	2017	2018	Change
Research and development materials and allocated production laboratory expenses	$ 10,203	$ 14,741	$4,538
Personnel expenses	16,784	18,166	1,382
Allocable facilities and information technology expenses	2,404	2,849	445
Software and cloud services expenses	505	1,280	775
Depreciation and other expenses	2,099	2,121	22
Total	$ 31,995	$ 39,157	$7,162

Research and development expenses were $39.2 million for the year ended December 31, 2018 compared to $32.0 million for the year ended December 31, 2017, representing an increase of $7.2 million, or 22%. The increase was primarily attributable to $4.5 million in additional cost of materials and allocated production laboratory expenses to support our immunoSEQ Dx and drug discovery initiatives, as well as the expansion of our platform. The increase also resulted from increases in personnel-related costs of $1.4 million, including a $0.5 million increase in share-based compensation, additional software and cloud services costs of $0.8 million, and an increase in allocable facilities and information technology costs of $0.4 million, which were primarily related to the expansion of our South San Francisco, California facilities.

Sales and Marketing

(in thousands, except percentages)	Year Ended December 31, 2017	Year Ended December 31, 2018	Change $	Change %	Percent of Revenue 2017	Percent of Revenue 2018
Sales and marketing	$16,765	$24,486	$7,721	46%	44%	44%

Sales and marketing expenses were $24.5 million for the year ended December 31, 2018 compared to $16.8 million for the year ended December 31, 2017, representing an increase of $7.7 million, or 46%. The increase was primarily attributable to $4.8 million in additional personnel-related costs (including a $1.5 million increase in share-based compensation) due to increased headcount mainly for expanding our clonoSEQ commercial and research business development teams, $1.8 million in marketing and medical education investments to support our clonoSEQ and corporate branding initiatives, $0.5 million in travel expenses and $0.4 million in consulting fees.

General and Administrative

(in thousands, except percentages)	Year Ended December 31, 2017	Year Ended December 31, 2018	Change $	Change %	Percent of Revenue 2017	Percent of Revenue 2018
General and administrative	$15,949	$20,409	$4,460	28%	41%	37%

General and administrative expenses were $20.4 million for the year ended December 31, 2018 compared to $16.0 million for the year ended December 31, 2017, representing an increase of $4.5 million, or 28%. The increase was primarily attributable to $3.3 million in additional personnel-related costs (including an increase in share-based compensation of $1.9 million) driven primarily by growth in salaries and related headcount. Legal and other professional support fees contributed $0.7 million of the increase.

Interest and Other Income, Net

(in thousands, except percentages)	Year Ended December 31, 2017	Year Ended December 31, 2018	Change $	Change %
Interest and other income, net	$1,644	$3,309	$1,665	101%

Interest income was $3.3 million for the year ended December 31, 2018 compared to $1.6 million for the year ended December 31, 2017, representing an increase of $1.7 million, or 101%. The increase was primarily attributable to an increase in marketable securities during the year ended December 31, 2018 as a result of the cash received from our Series F-1 convertible preferred stock financing and rising interest rates.

Comparison of the Three Months Ended March 31, 2018 and 2019

	Three Months Ended March 31,	
	2018	2019
	(unaudited) (in thousands)	
Revenue		
Sequencing revenue	$ 5,780	$ 6,083
Development revenue	3,935	6,583
Total revenue	9,715	12,666
Operating expenses		
Cost of revenue	3,989	4,988
Research and development	8,855	12,483
Sales and marketing	5,047	7,817
General and administrative	4,543	7,004
Amortization of intangible assets	419	419
Total operating expenses	22,853	32,711
Loss from operations	(13,138)	(20,045)
Interest and other income, net	747	1,659
Net Loss	(12,391)	(18,386)
Fair value adjustment to Series E-1 convertible preferred stock options	4	(254)
Net loss attributable to common shareholders	$(12,387)	$(18,640)

Revenue

(in thousands, except percentages)	Three Months Ended March 31,		Change		Percent of Revenue	
	2018	2019	$	%	2018	2019
	(unaudited)					
Revenue						
Sequencing revenue	$5,780	$ 6,083	$ 303	5%	59%	48%
Development revenue	3,935	6,583	2,648	67%	41%	52%
Total revenue	$9,715	$12,666	$2,951	30%	100%	100%

Total revenue was $12.7 million for the three months ended March 31, 2019, compared to $9.7 million for the three months ended March 31, 2018, representing an increase of $3.0 million, or 30%.

Sequencing revenue increased to $6.1 million for the three months ended March 31, 2019, representing an increase of $0.3 million, or 5%. The increase in sequencing revenue was primarily attributable to an increase of $0.5 million in secured payor coverage, including $0.4 million relating to tests delivered in periods prior to the three months ended March 31, 2019. This increase was offset by a decrease of $0.2 million in revenue generated from biopharmaceutical and academic customers.

Research sequencing volume decreased by 29% to 4,891 sequences delivered in the three months ended March 31, 2019 from 6,858 sequences delivered in the three months ended March 31, 2018. Clinical sequencing volume increased by 37% to 2,011 clinical tests in the three months ended March 31, 2019 from 1,466 clinical tests in the three months ended March 31, 2018.

Development revenue increased to $6.6 million for the three months ended March 31, 2019, representing an increase of $2.6 million, or 67%. The increase was primarily attributable to $6.3 million

of revenue generated from the Genentech Agreement, offset by a $2.6 million decrease relating to translational agreements and a $1.0 million net decrease in support services for clonoSEQ.

Cost of Revenue

(in thousands, except percentages)	Three Months Ended March 31,		Change		Percent of Revenue	
	2018	2019	$	%	2018	2019
	(unaudited)					
Cost of revenue	$3,989	$4,988	$999	25%	41%	39%

Cost of revenue was $5.0 million for the three months ended March 31, 2019, compared to $4.0 million for the three months ended March 31, 2018, representing an increase of $1.0 million, or 25%. The increase in cost of revenue was primarily attributable to an increase of $0.9 million in the cost of overhead due to the production laboratory expansion and increasing sample volumes.

Research and Development

(in thousands, except percentages)	Three Months Ended March 31,		Change		Percent of Revenue	
	2018	2019	$	%	2018	2019
	(unaudited)					
Research and development	$8,855	$12,483	$3,628	41%	91%	99%

The following table presents disaggregated research and development expenses by cost classification for the periods presented:

(in thousands)	Three Months Ended March 31,		
	2018	2019	Change
	(unaudited)		
Research and development materials and allocated production laboratory expenses	$ 3,573	$ 5,060	$ 1,487
Personnel expenses	4,070	5,607	1,537
Allocable facilities and information technology expenses	569	820	251
Software and cloud services expenses	209	266	57
Depreciation and other expenses	434	730	296
Total	$ 8,855	$ 12,483	$ 3,628

Research and development expenses were $12.5 million for the three months ended March 31, 2019, compared to $8.9 million for the three months ended March 31, 2018, representing an increase of $3.6 million, or 41%. The increase was primarily attributable to $1.5 million in additional personnel-related expenses, including a $0.1 million increase in share-based compensation, and a $1.5 million increase in cost of materials and allocated production laboratory expenses to support our immunoSEQ Dx and drug discovery initiatives, as well as the expansion of our platform. The increase also resulted from a $0.3 million increase in allocable facilities and information technology, $0.1 million in software and cloud services and a $0.3 million increase in depreciation and other expenses.

Sales and Marketing

(in thousands, except percentages)	Three Months Ended March 31,		Change		Percent of Revenue	
	2018	2019	$	%	2018	2019
	(unaudited)					
Sales and marketing	$5,047	$7,817	$2,770	55%	52%	62%

Sales and marketing expenses were $7.8 million for the three months ended March 31, 2019, compared to $5.0 million for the three months ended March 31, 2018, representing an increase of $2.8 million, or 55%. The increase was primarily attributable to $1.6 million in additional personnel costs related to the diagnostics commercial team expansion and a $0.7 million increase in travel, entertainment and customer event related expenses. An additional $0.4 million in consulting fees and a $0.1 million increase in computer and software expenses also contributed to the overall increase.

General and Administrative

(in thousands, except percentages)	Three Months Ended March 31,		Change		Percent of Revenue	
	2018	2019	$	%	2018	2019
	(unaudited)					
General and administrative	$4,543	$7,004	$2,461	54%	47%	55%

General and administrative expenses were $7.0 million for the three months ended March 31, 2019, compared to $4.5 million for the three months ended March 31, 2018, representing an increase of $2.5 million, or 54%. The increase was primarily attributable to additional business taxes of $1.3 million due to the Genentech upfront payment received in February 2019 and $0.7 million in additional legal, tax, accounting and consultant fees. An increase in personnel-related costs of $0.3 million, net of a $0.2 million decrease in share-based compensation, and a $0.1 million increase in computer and software expenses also contributed to the overall increase.

Interest and Other Income, Net

(in thousands, except percentages)	Three Months Ended March 31,		Change	
	2018	2019	$	%
	(unaudited)			
Interest and other income, net	$747	$1,659	$912	122%

Interest income was $1.7 million for the three months ended March 31, 2019, compared to $0.8 million for the three months ended March 31, 2018, representing an increase of $0.9 million, or 122%. The increase was primarily attributable to interest earned on a larger portfolio and favorable interest rates.

Liquidity and Capital Resources

We have incurred losses since inception and have incurred negative cash flows from operations from inception through December 31, 2018. As of March 31, 2019, we had an accumulated deficit of $314.5 million.

We have funded our operations to date principally from the sale of convertible preferred stock and, to a lesser extent, sequencing and development revenue. In December 2018, we entered into the Genentech Agreement pursuant to which we received a $300.0 million initial upfront payment in February 2019, may receive approximately $1.8 billion over time, including payments upon achievement of specified development, regulatory and commercial milestones, and may receive additional royalties on sales of products commercialized under this agreement. As of March 31, 2019, we had cash, cash equivalents and marketable securities of $440.4 million.

We believe our cash flows from operations and our existing cash, cash equivalents and marketable securities, together with the net proceeds from this offering, will be sufficient to fund our operating expenses and capital expenditure requirements through at least the 12 months following the date of this prospectus. We may consider raising additional capital to expand our business, to pursue strategic investments, to take advantage of financing opportunities or for other reasons.

We plan to utilize the existing cash, cash equivalents and marketable securities on hand primarily to fund our commercial and marketing activities associated with our clinical products and services, continued research and development initiatives for our pipeline candidates and drug discovery initiatives, ongoing investments into our immune medicine platform and scaling of our laboratory operations with our anticipated growth. Cash in excess of immediate requirements is invested in accordance with our investment policy, primarily with a view to liquidity and capital preservation. Currently, our funds are held in money market funds and marketable securities consisting of U.S. government debt securities, U.S. government agency bonds, commercial paper and corporate bonds.

As revenue from sales of immunoSEQ and clonoSEQ is expected to grow, we expect our accounts receivable and inventory balances to increase. Any increase in accounts receivable and inventory may not be completely offset by increases in accounts payable and accrued expenses, which could result in greater working capital requirements. Moreover, following the closing of this offering, we expect to incur additional costs associated with operating as a public company, including expenses related to legal, accounting, regulatory, exchange listing and SEC compliance matters.

If our available cash, cash equivalents and marketable securities balances, net proceeds from this offering and anticipated cash flow from operations are insufficient to satisfy our liquidity requirements, we may seek to sell additional equity or convertible debt securities, enter into a credit facility or another form of third-party funding or seek other debt financing. The sale of equity and convertible debt securities may result in dilution to our shareholders and, in the case of preferred equity securities or convertible debt, those securities could provide for rights, preferences or privileges senior to those of our common stock. The terms of debt securities issued or borrowings pursuant to a credit agreement could impose significant restrictions on our operations. Additional capital may not be available on reasonable terms, or at all.

Cash Flows

The following table summarizes our uses and sources of cash for each of the periods presented (in thousands):

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
Cash (used in) provided by operating activities	$(34,858)	$(32,259)	$ (6,097)	$ 278,303
Cash provided by (used in) investing activities	36,432	736	(36,688)	(222,176)
Cash provided by financing activities	50,034	1,248	467	124

Operating Activities

Cash used in operating activities during the year ended December 31, 2018 was $32.3 million, which was primarily attributable to a net loss of $46.4 million, offset by non-cash share-based compensation of $11.1 million and non-cash depreciation and amortization of $4.8 million, and a net change in our operating assets and liabilities of $1.7 million. The net change in our operating assets and liabilities reflects an increase in inventory of $3.0 million to support growth in our laboratory, an increase in accounts payable and accrued liabilities of $2.2 million due to increased headcount, a decrease of $0.6 million in deferred revenue due to increased development revenue and a decrease of $0.5 million in deferred rent due to increases in cash rental payments.

Cash used in operating activities during the year ended December 31, 2017 was $34.9 million, which was primarily attributable to a net loss of $42.8 million, offset by non-cash share-based compensation of $7.0 million, non-cash depreciation and amortization of $6.1 million, and a net change

in our operating assets and liabilities of $5.5 million. The net change in our operating assets and liabilities reflects an increase in inventory of $2.7 million to support growth in laboratory, a $2.5 million increase in deferred revenue due to MRD biopharmaceutical agreements entered into in 2017, an increase in accounts receivable of $2.4 million due to increased sequencing revenue, a decrease in accounts payable and accrued liabilities of $1.5 million primarily due to the payment of severance amounts for restructuring activities initiated in 2016 and reductions in deferred rent of $1.1 million due to increased cash rent payments.

Cash provided by operating activities during the three months ended March 31, 2019 was $278.3 million, which was primarily attributable to a net change in our operating assets and liabilities of $292.5 million, non-cash share-based compensation of $3.0 million and non-cash depreciation and amortization of $1.2 million, offset by a net loss of $18.4 million. The net change in our operating assets and liabilities reflects an increase in deferred revenue of $296.1 million primarily due to the $300.0 million upfront payment by Genentech, a decrease in accounts receivable of $0.7 million due to the timing of collections, an increase in prepaid expenses and other current assets of $3.7 million due to receivables from investment maturities, a decrease in accounts payable and accrued liabilities of $0.4 million largely due to corporate bonus payments and a decrease in deferred rent of $0.2 million due to increases in cash rental payments.

Cash used in operating activities during the three months ended March 31, 2018 was $6.1 million, which was primarily attributable to a net loss of $12.4 million, offset by non-cash share-based compensation of $3.1 million, non-cash depreciation and amortization of $1.3 million and a net change in our operating assets and liabilities of $1.9 million. The net change in our operating assets and liabilities reflects a $4.2 million increase in deferred revenue due to upfront payments from translational development customers, a decrease in accounts receivable of $2.2 million due to the timing of receipts, offset by an increase in inventory of $2.0 million to support growth in revenue and research and development activities, a decrease in accounts payable and accrued liabilities of $2.4 million primarily due to corporate bonus payments and reduction in marketing and legal payables, and reductions in deferred rent of $0.2 million due to increased cash rent payments.

Investing Activities

Cash provided by investing activities during the year ended December 31, 2018 was $0.7 million, which was primarily attributable to maturities of marketable securities of $153.5 million, partially offset by purchases of marketable securities of $146.5 million and purchases of property and equipment of $6.3 million.

Cash provided by investing activities during the year ended December 31, 2017 was $36.4 million, which was primarily attributable to maturities of marketable securities of $163.9 million, partially offset by purchases of marketable securities of $125.2 million and purchases of property and equipment of $2.4 million.

Cash used in investing activities during the three months ended March 31, 2019 was $222.2 million, which was primarily attributable to purchases of marketable securities of $270.9 million and purchases of property and equipment of $3.8 million, partially offset by maturities of marketable securities of $52.5 million.

Cash used in investing activities during the three months ended March 31, 2018 was $36.7 million, which was primarily attributable to maturities of marketable securities of $45.2 million, partially offset by purchases of marketable securities of $81.3 million and purchases of property and equipment of $0.6 million.

Financing Activities

Cash provided by financing activities during the year ended December 31, 2018 was $1.2 million, which was primarily attributable to proceeds from the exercise of stock options.

Cash provided by financing activities during the year ended December 31, 2017 was $50.0 million, which was primarily attributable to proceeds from issuance of Series F-1 convertible preferred stock of $49.8 million, net of issuance costs, and proceeds of $0.2 million from the exercise of stock options.

Cash provided by financing activities during the three months ended March 31, 2019 was $0.1 million, which was primarily attributable to proceeds from the exercise of stock options.

Cash provided by financing activities during the three months ended March 31, 2018 was $0.5 million, which was primarily attributable to proceeds from the exercise of stock options.

Contractual Obligations and Commitments

The following table summarizes our contractual obligations as of December 31, 2018, which represents contractually committed future obligations (in thousands):

		Expected Payments by Period			
	Total	2019	2020-2021	2022-2023	More than 5 Years
Operating lease obligations[1]	$ 19,924	$ 3,561	$ 7,736	$ 6,312	$ 2,315
Purchase commitments[2]	12,764	1,962	3,791	4,290	2,721
Total	$ 32,688	$ 5,523	$ 11,527	$ 10,602	$ 5,036

(1) We lease office and laboratory space in Seattle, Washington and South San Francisco, California. Please see Note 10 to our audited financial statements and Note 8 to our unaudited condensed financial statements for additional information pertaining to operating lease commitments.

(2) Purchase commitments include commitments for cloud data storage through our collaboration with Microsoft, commitments to support clinical trials utilizing clonoSEQ, software and service license commitments, and minimum commitments for one laboratory material supplier.

As of March 31, 2019, there have been no material changes to our contractual obligations and commitments.

Net Operating Loss Carryforwards

Utilization of our NOL carryforwards and credits may be subject to a substantial annual limitation due to the ownership change limitations provided by Section 382 of the Code (“Section 382”) and similar state provisions. The annual limitation may result in the expiration of NOL carryforwards and credits before utilization. If there should be an ownership change, our ability to utilize our NOL carryforwards and credits could be limited. We have completed a Section 382 analysis and have determined there are no permanent limitations on the utilization of approximately $186.9 million of our federal NOLs as of December 31, 2018. Based on the available objective evidence, management determined that it was more likely than not that the net deferred tax assets would not be realizable as of December 31, 2018 and 2017. Accordingly, management applied a full valuation allowance against net deferred tax assets as of December 31, 2018 and 2017.

In December 2017, the TCJA became law. The TCJA decreases the U.S. corporate federal income tax rate from 35% to 21% effective January 1, 2018. The reduction in the tax rate resulted in a $25.0 million reduction in net deferred tax assets. There was no impact on recorded deferred tax balances as the remeasurement of net deferred tax assets was offset by a change in valuation allowance for the same amount. Under the TCJA, federal NOLs incurred in 2018 and in future years may be carried forward indefinitely, but the deductibility of such federal NOLs is limited.

Off-Balance Sheet Arrangements

As of December 31, 2018 and March 31, 2019, we have not had any off-balance sheet arrangements, as defined in the rules and regulations of the SEC.

Quantitative and Qualitative Disclosures about Market Risk

Interest Rate Risk

We are exposed to market risk for changes in interest rates related primarily to our cash and cash equivalents, and marketable securities. As of March 31, 2019, we had cash and cash equivalents of $111.3 million, held primarily in cash deposits, money market funds and commercial paper. Our marketable securities are held in U.S. government debt securities, U.S. government agency bonds, commercial paper and corporate bonds. As of March 31, 2019, we had short-term marketable securities of $329.2 million. Our primary exposure to market risk is interest income sensitivity, which is affected by changes in the general level of interest rates in the United States. As of March 31, 2019, a hypothetical 100 basis point increase in interest rates would have resulted in an approximate $1.8 million decline of the fair value of our available-for-sale securities. This estimate is based on a sensitivity model that measures market value changes when changes in interest rates occur.

Critical Accounting Policies and Estimates

We have prepared our financial statements in accordance with GAAP. Our preparation of these financial statements requires us to make estimates, assumptions and judgments that affect the reported amounts of assets, liabilities and related disclosures at the date of the financial statements, as well as revenue and expense recorded during the reporting periods. We evaluate our estimates and judgments on an ongoing basis. We base our estimates on historical experience and or other relevant assumptions that we believe to be reasonable under the circumstances. Estimates are used in several areas, including, but not limited to, estimates of progress to date for certain performance obligations and transaction price for certain contracts with customers, share-based compensation, including the fair value of common stock, and the provision for income taxes, including related reserves, and goodwill, among others. These estimates generally involve complex issues and require judgments, involve the analysis of historical results and prediction of future trends, can require extended periods of time to resolve and are subject to change from period to period. Actual results may differ materially from management’s estimates.

While our significant accounting policies are described in more detail in Note 2 to our audited financial statements and Note 2 to our unaudited condensed financial statements included elsewhere in this prospectus, we believe the following accounting policies to be critical to the judgments and estimates used in the preparation of our financial statements.

Revenue Recognition

Our development and sequencing revenue arrangements may include upfront payments for the performance of services in the future, which have both fixed and variable consideration.

Non-refundable upfront fees and funding for related development services are generally considered fixed consideration, while milestone payments are identified as variable consideration.

In determining the appropriate amount of revenue to recognize as we fulfill our obligations under these agreements, we perform the following steps to determine the amount of revenue to be recognized: (i) identification of contract or contracts; (ii) determination of whether the promised goods or services are performance obligations, including whether they are distinct in the context of the contract; (iii) measurement of the transaction price, including the constraint on variable consideration; (iv) allocation of the transaction price to the performance obligations based on estimated selling prices; and (v) recognition of revenue when (or as) we satisfy each performance obligation.

A performance obligation is a promise in a contract to transfer a distinct good or service to the customer and is the unit of account in Accounting Standard Codification ("ASC") Topic 606, *Revenue from Contracts with Customers*. Our performance obligations include sequencing services and services associated with regulatory submission and approval processes. Significant management judgment is applied to determine (1) the measurement of the transaction price, including the constraint on variable consideration, (2) the allocation of the transaction price to the performance obligations and (3) the appropriate input or output based method to recognize revenue and the extent of progress to date.

We include the unconstrained amount of estimated variable consideration in the transaction price. The amount included in the transaction price is constrained to the amount for which it is probable that a significant reversal of cumulative revenue recognized will not occur. At the end of each subsequent reporting period, we re-evaluate the estimated variable consideration included in the transaction price and any related constraint and, if necessary, adjust our estimate of the overall transaction price.

To determine the allocation of the transaction price to the performance obligations, we apply the adjusted market assessment approach. Using this approach, we evaluate the market in which we sell the services and estimate the price that a customer in that market would be willing to pay for those services.

To select the measure of progress, we consider the expectations of the performance period which may be based on customer-dependent estimates of samples or internal estimates of the performance period based on both the customer and our expected development timeframes. We regularly review our expectations of the extent of progress, including whether any variable consideration is no longer constrained, and, if any changes in estimates are made, we recognize revenue using the cumulative catch-up method.

Share-Based Compensation

We measure share-based compensation expense for stock options granted to our employees and directors on the date of grant and recognize the corresponding compensation expense of those awards over the requisite service period, which is generally the vesting period of the respective award.

We estimate the fair value of stock options granted to our employees and directors on the grant date, and the resulting share-based compensation expense, using the Black-Scholes option-pricing model. The Black-Scholes option-pricing model requires the use of assumptions regarding a number of variables that are complex, subjective and generally require significant judgment to determine. The assumptions used to calculate the fair value of our stock options were:

Fair value of common stock

The fair value of our common stock issuable upon exercise of the stock options was determined by our board of directors, with input from management and independent third-party valuations, as discussed in "*—Common Stock Valuations*" below.

Expected term

Our expected term represents the period that our stock options are expected to be outstanding and is determined using a simplified method, based on the midpoint between the vesting date and the end of the contractual term, as we do not have sufficient historical data to use any other method to estimate expected term.

Expected volatility

As there has been no public market for our common stock to date, and as a result we do not have any trading history of our common stock, expected volatility is estimated based on the average volatility for comparable publicly traded peer group companies in the same industry over a period equal to the expected term of the stock option grants. The comparable companies are chosen based on their similar size, stage in the life cycle or area of specialty.

Risk-free interest rate

The risk-free interest rate is based on the U.S. treasury zero coupon issues in effect at the time of grant for periods corresponding with the expected term of the stock option grants.

Expected dividend yield

We have no plans to pay dividends on our common stock. Therefore, we use an expected dividend yield of zero.

Black-Scholes assumptions

The weighted-average assumptions used in our Black-Scholes option-pricing model were as follows for our employee stock option grants for the periods presented:

	Adaptive 2009 Equity Incentive Plan			
	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
Grant date fair value	$6.27	$6.55	$ 6.55	$ 7.80
Expected term (in years)	6.12	6.14	6.17	6.04
Risk-free interest rate	2.0%	2.7%	2.6%	2.5%
Expected volatility	70.2%	68.1%	69.2%	64.4%
Expected dividend yield	—	—	—	—

As of January 1, 2018, we adopted Accounting Standards Update 2016-09, *Compensation—Stock Compensation* (Topic 718) and elected to account for forfeitures as they occur rather than estimate expected forfeitures over the vesting period of the respective grant.

We use judgment in evaluating the assumptions related to our share-based compensation on a prospective basis. As we continue to accumulate additional data related to our common stock, we may have refinements to our estimates, which could materially impact our future share-based compensation expense. At December 31, 2018, unrecognized share-based compensation expense related to unvested stock options was $18.3 million, which is expected to be recognized over a remaining weighted-average period of 2.72 years.

At March 31, 2019, unrecognized share-based compensation expense related to unvested stock options was $25.4 million, which is expected to be recognized over a remaining weighted-average period of 2.99 years.

Common Stock Valuations

As there has been no public market for our common stock to date, the estimated fair value of the common stock issuable upon exercise of our stock options was determined by our board of directors, with input from management, considering our most recently available third-party valuations of common stock and our board of directors' assessment of additional objective and subjective factors that it believed were relevant, and factors that may have changed from the date of the most recent valuation through the date of the grant, which intended all options granted to be exercisable at a price per share not less than the fair value per share of our common stock issuable upon exercise of those options on the date of grant. We believe our board of directors has the relevant experience and expertise to determine the fair value of our common stock. Prior to our initial public offering, given the absence of a public trading market for our common stock, the valuations of our common stock were determined in accordance with the guidelines outlined in the American Institute of Certified Public Accountants Practice Aid, *Valuation of Privately-Held-Company Equity Securities Issued as Compensation*. The assumptions we use in the valuation model are based on future expectations combined with management's judgment. In the absence of a public trading market, our board of directors, with input from management, exercised significant judgment and considered numerous objective and subjective factors to determine the fair value of our common stock as of the date of each option grant, including the following factors:

- independent valuations performed at periodic intervals by an independent third-party valuation firm;
- the prices, rights, preferences and privileges of our convertible preferred stock relative to our common stock;
- our operating and financial performance, forecasts and capital resources;
- current business conditions;
- the hiring of key personnel;
- our stage of commercialization;
- the status of research and development efforts;
- the likelihood of achieving a liquidity event for the shares of common stock issuable upon exercise of these stock options, such as an initial public offering or sale of our company, given prevailing market conditions;
- any adjustment necessary to recognize a lack of marketability for our common stock;
- trends and developments in our industry;
- the market performance of comparable publicly traded technology companies; and
- the U.S. and global economic and capital market conditions.

In valuing our common stock, we utilized a hybrid methodology that includes a probability-weighted expected return method ("PWERM") and an option pricing method ("OPM"), which is a highly complex and subjective valuation methodology. Under a PWERM, the fair market value of the common stock is estimated based upon an analysis of future values for the enterprise assuming various future outcomes. Within one of those potential outcomes, we utilized the OPM. The OPM treats the rights of the holders of convertible preferred stock and common stock as equivalent to that of call options on any value of the enterprise above certain break points of value based upon the liquidation preferences of the holders of preferred stock, as well as their rights to participation and conversion. Based on the timing and nature of an assumed liquidity event in each scenario, a discount for lack of marketability either was or was not applied to each scenario as appropriate. We then probability-weighted the value of each expected outcome to arrive at an estimate of fair value per share of common stock.

For valuations after the closing of this offering, our board of directors plans to determine the fair value of each share of common stock based on the closing price of our common stock on the date of grant or other relevant determination date, as reported on The Nasdaq Global Select Market.

Goodwill

Goodwill represents the excess of the purchase price over the net amount of identifiable assets acquired and liabilities assumed in a business combination measured at fair value. We assess goodwill for impairment annually on October 1 and upon any occurrence of triggering events or substantive changes in circumstances that could indicate a potential impairment.

We evaluate goodwill for impairment by first assessing qualitative factors to determine whether it is more likely than not that the fair value of our reporting unit is less than its carrying amount. We evaluate certain qualitative factors such as macroeconomic conditions, the market and industry in which we operate, cost factors, overall financial performance and other relevant entity-specific events to determine if there are any negative trends or events that could indicate impairment. Key assumptions in this analysis include anticipated demand for our products and services, including industry and regulatory changes, future revenue growth and cash, cash equivalents and marketable securities on hand. These assumptions are determined based on our historical performance and management's forecasted results. Management's estimates of forecasted results are based upon assumptions believed to be reasonable, but which are inherently uncertain and unpredictable and, as a result, actual results may differ from estimates. If we determine that it is more likely than not that the fair value of our reporting unit is less than its carrying amount, or if we choose to bypass the qualitative assessment, we perform a quantitative goodwill impairment test. Goodwill impairment exists when the estimated fair value of our one reporting unit is less than its carrying value. If impairment exists, the carrying value of the goodwill is reduced to fair value through an impairment charge recorded in our statements of operations. To date, we have not recognized any impairment of goodwill.

JOBS Act Accounting Election

We are an "emerging growth company" within the meaning of the JOBS Act. The JOBS Act allows an emerging growth company to delay the adoption of new or revised accounting standards that have different effective dates for public and private companies until those standards apply to private companies. We have elected to use this extended transition period and, as a result, our financial statements may not be comparable to companies that comply with public company effective dates. We also intend to rely on other exemptions provided by the JOBS Act, including not being required to comply with the auditor attestation requirements of Section 404(b) of the Sarbanes-Oxley Act.

We will remain an emerging growth company until the earliest of (1) the last day of the fiscal year following the fifth anniversary of the closing of this offering, (2) the last day of the fiscal year in which we have total annual gross revenue of at least $1.07 billion, (3) the last day of the fiscal year in which we are deemed to be a "large accelerated filer" as defined in Rule 12b-2 under the Exchange Act, which would occur if the market value of our common stock held by non-affiliates exceeded $700.0 million as of the last business day of the second fiscal quarter of such year or (4) the date on which we have issued more than $1.0 billion in non-convertible debt securities during the prior three-year period.

Recent Accounting Pronouncements

See Note 2 to our audited financial statements and Note 2 to our unaudited condensed financial statements included elsewhere in this prospectus for more information.

BUSINESS

Overview

We are advancing the field of immune-driven medicine by harnessing the inherent biology of the adaptive immune system to transform the diagnosis and treatment of disease. We believe the adaptive immune system is nature's most finely tuned diagnostic and therapeutic for most diseases, but the inability to decode it has prevented the medical community from fully leveraging its capabilities. Our immune medicine platform applies our proprietary technologies to read the diverse genetic code of a patient's immune system and understand precisely how it detects and treats disease in that patient. We capture these insights in our dynamic clinical immunomics database, which is underpinned by computational biology and machine learning, and use them to develop and commercialize clinical products and services that we are tailoring to each individual patient. We have two commercial products and services and a robust pipeline of clinical products and services that we are designing to diagnose, monitor and enable the treatment of diseases such as cancer, autoimmune conditions and infectious diseases. Since our inception in 2009, we have characterized over 20 billion immune receptors, established partnerships and commercial relationships with over 125 biopharmaceutical companies and launched two product lines. Our goal is to understand the adaptive immune system and translate it into new products with unprecedented scale, precision and speed.

Our immune medicine platform is the foundation for our expanding suite of products and services. The cornerstone of our platform and core immunosequencing product, immunoSEQ, serves as our underlying research and development engine and generates revenue from academic and biopharmaceutical customers. Our first clinical diagnostic product, clonoSEQ, is the first test authorized by the FDA for the detection and monitoring of MRD in patients with MM and ALL and is being validated for patients with other blood cancers. Leveraging our collaboration with Microsoft to create the TCR-Antigen Map, we are also developing a diagnostic product, immunoSEQ Dx, that may enable early detection of many diseases from a single blood test. Our therapeutic product candidates, being developed under the Genentech Agreement, leverage our platform to identify specific immune cells to develop into cellular therapies in oncology. We believe this approach has the potential to be applicable to patients across a wide range of cancers.

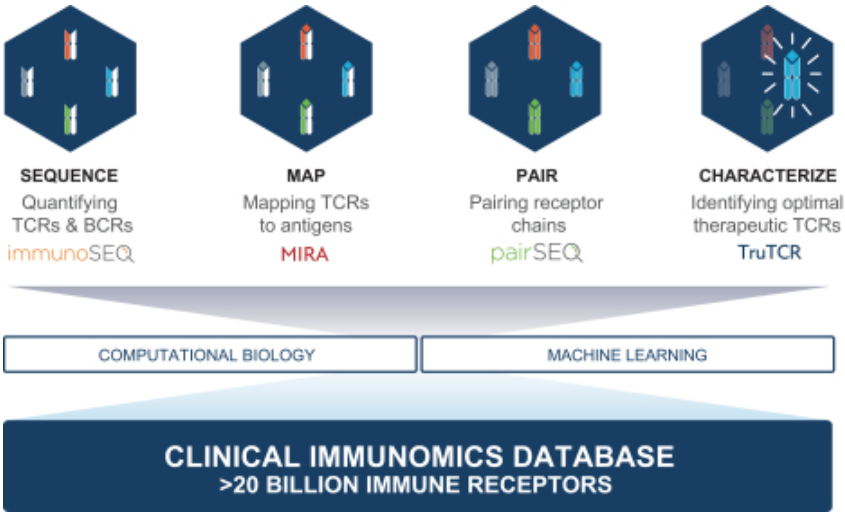
Immune-driven medicine is one of the largest global addressable markets in healthcare. We estimate the potential market opportunity for our portfolio to be $48.7 billion, including $1.0 billion for research products, $16.3 billion for clinical diagnostics and $31.4 billion for cellular therapy in oncology. We use multiple sources and assumptions to estimate the total addressable market for immune-driven medicine. While we believe them to be reasonable, these sources and assumptions may be incorrect or subject to change due to any number of factors. In particular, our drug discovery initiatives are still in the early stages of development, which may make our assumptions and estimates more uncertain. Despite the novelty of this area, we believe we are uniquely positioned to develop and commercialize a pipeline of immune-driven diagnostic and therapeutic products across multiple disease states by leveraging the cumulative learning from our immune medicine platform.

Our Immune Medicine Platform

The adaptive immune system is comprised of specialized cells, called T cells and B cells, which hold the instructions for diagnosing and treating most diseases. These instructions enable these cells to identify, bind and destroy pathogens or human cells presenting foreign antigens using receptors on their cell surface. Unlike all other genes in the human genome, the genetic sequences of TCRs and BCRs rearrange over time creating massive genetic diversity. The resulting diversity of the adaptive immune repertoire, which consists of over 100 million different genes in a healthy adult compared to approximately 30,000 genes in the static human genome, gives the immune system the ability to detect and respond to millions of different antigens associated with human disease.

Our immune medicine platform combines a suite of proprietary technologies, bioinformatics, software and machine learning to generate clinical immunomics data to decode the adaptive immune system. It extracts and interprets insights from the adaptive immune system with the scale, precision and speed required to enable the design of clinical products tailored to the specific genetics of each patient's immune system.

Our Immune Medicine Platform



Our immune medicine platform performs the following key functions related to immune receptors:

- *Sequence.* immunoSEQ sequences single chains of "Y-shaped" TCRs or BCRs using NGS, enabling us to understand the quantity and diversity of T and B cells in a biological sample. This provides deep insights into individual and collective immune responses at a scale that is thousands of times greater than was previously possible.
- *Map.* MIRA (Multiplexed Identification of T cell Receptor Antigen Specificity) maps millions of TCRs to thousands of clinically relevant antigens. Combined with immunoSEQ, MIRA elucidates what potential diseases a patient's immune system has been exposed to or is actively fighting.
- *Pair.* pairSEQ builds on immunoSEQ by using a combinatorial strategy to accurately pair both chains of Y-shaped immune cell receptors at high-throughput, which is challenging to do at scale using other methods because the two chains of the Y-shaped receptors are located on different chromosomes. The ability to accurately pair both chains of the receptors in a sample enables us to reconstruct receptors for therapeutic purposes.
- *Characterize.* TruTCR characterizes binding, cytotoxicity and safety properties of antigen-specific, paired TCRs to identify a subset that is therapeutic-grade, enabling the discovery and development of optimal clinical candidates to be engineered into TCR-mediated cellular therapies.

The massive amount of data generated by our immune medicine platform is stored in our dynamic clinical immunomics database of over 30 billion immune receptors, of which we have data rights to over 20 billion. We believe the application of machine learning, supported by our collaboration with Microsoft, has the potential to exponentially accelerate our ability to derive novel insights from this database and use them to inform our robust product development efforts.

Our Current Products and Pipeline

Our current portfolio includes commercial products and services in life sciences research and clinical diagnostics, and we are developing products and services in both clinical diagnostics and drug discovery. Our commercial research product, immunoSEQ, primarily serves as our underlying research and development engine to develop and validate our clinical pipeline. We plan to continue to invest in our immune medicine platform to develop additional clinical products, which we prioritize based on clinical actionability, unmet medical need and commercial viability.

Life Sciences Research

Our immunoSEQ research service and kit are used to answer translational research questions and discover new prognostic and diagnostic signals. Our technology has been used for research purposes by over 2,000 academic researchers and more than 125 biopharmaceutical companies and incorporated into over 480 clinical trials since our inception in 2009. We intend to initiate development of a next generation, sample-type agnostic RUO kit, which we expect to enable global distribution of our research product. We are working to analytically validate the improved version of immunoSEQ so that all research data generated using immunoSEQ can be used for clinical validation of potential diagnostic applications.

Clinical Diagnostics

Our clonoSEQ diagnostic test detects and monitors the remaining number of cancer cells that are present in a patient's body during and after treatment, known as MRD. clonoSEQ was granted marketing authorization from the FDA, under the *de novo* process, in September 2018 for patients with MM and ALL to monitor their MRD from bone marrow samples. In January 2019, clonoSEQ received Medicare coverage aligned with the FDA label and NCCN guidelines for longitudinal monitoring in MM and ALL, and subsequently clonoSEQ received coverage from three private payors representing approximately 68 million covered lives. clonoSEQ is also available for use in other lymphoid cancers as an LDT. clonoSEQ testing has been ordered by clinicians in nearly 300 healthcare systems and institutions, including 27 of the 28 NCCN centers in the United States, and used by more than 30 biopharmaceutical companies in over 120 clinical trials. We continue to invest in the commercial success of clonoSEQ by establishing a specialized sales organization and infrastructure in the United States and by exploring partnerships with diagnostic companies in other parts of the world. We believe clonoSEQ has broad applicability and we intend to file to expand the clonoSEQ FDA label to multiple additional indications, starting with CLL in 2019, followed by NHL to further expand its usage. Importantly, we are also generating data for submission to validate the use of clonoSEQ to monitor MRD from blood samples, which is less invasive than bone marrow samples, and may facilitate more frequent monitoring and broader physician adoption.

Leveraging Microsoft's machine learning capabilities to create the TCR-Antigen Map, we are developing a diagnostic product, immunoSEQ Dx, that may enable early detection of many diseases from a single blood test. Initially, we are validating early detection testing for a set of discrete diseases for which there is a significant unmet medical need for better diagnostic testing and early intervention, and where antigen specificity is well-known. These include certain prevalent cancer types and autoimmune disorders. In 2019, we plan to confirm the first indications to bring to the FDA for review in 2020 while continuing signal validation in several additional indications. We believe we are uniquely positioned to rapidly identify signals for early detection across many disease states simultaneously because our immune medicine platform works with retrospective sample sets and uses machine learning and computational statistics to continuously improve our detection and accuracy without requiring large cohorts of prospective patients.

Drug Discovery

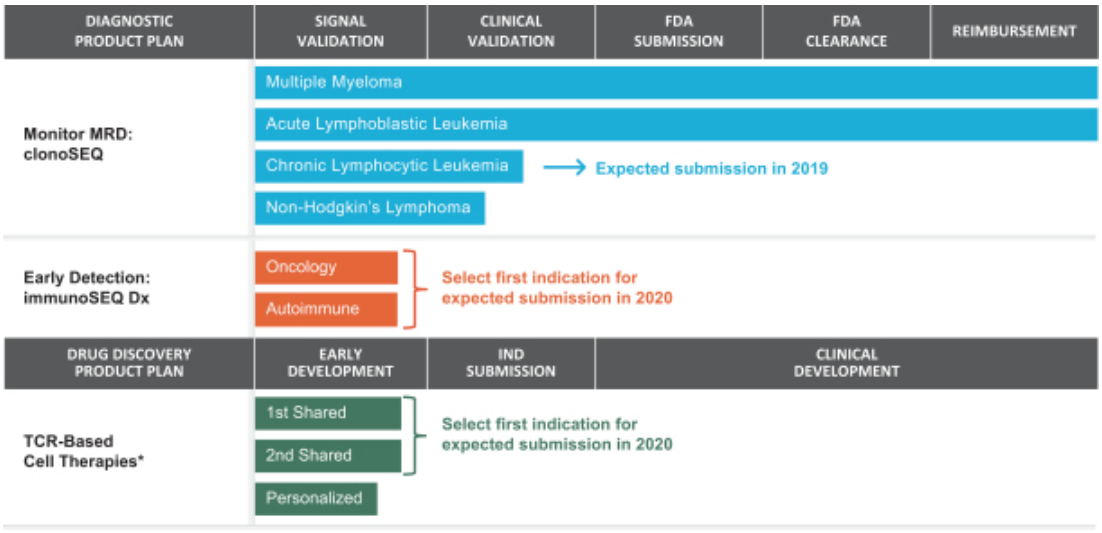
Our TruTCR process characterizes TCRs against shared antigens for use in the development of therapeutics. In December 2018, we entered into an exclusive collaboration with Genentech to

leverage this capability for the development of cellular therapies in oncology. We are pursuing two product development pathways for novel T cell immunotherapies in which Genentech intends to use TCRs screened by our immune medicine platform to engineer and manufacture cellular medicines:

- *Shared Products.* The shared products will use "off-the-shelf" TCRs identified against cancer antigens shared among patients.
- *Personalized Product.* The personalized product will use patient-specific TCRs identified by real-time screening of TCRs against cancer antigens in each patient.

In parallel, we plan to evaluate an investment in facilities for the screening of patient-specific TCRs to shorten the time from patient blood draw to infusion of the Personalized Product. We believe this investment would position us to potentially pursue additional opportunities outside of this collaboration, including cellular therapy in other disease states and cancer vaccines.

Our Clinical Pipeline



* Product candidates in development as part of our worldwide collaboration and license agreement with Genentech. The "1st Shared" and "2nd Shared" product candidates refer to the two lead product candidates selected from our library of TCRs that target cancer antigens present in many cancer patients. Genentech will determine the timing of discussions with, and submissions to, the FDA.

Our Market

Immune-driven medicine is one of the largest global addressable markets in healthcare. We estimate our total potential addressable market to be $48.7 billion based on our current products and pipeline. We believe this market will grow over time as clinicians increasingly appreciate the importance of the immune system in the diagnosis and treatment of disease and as our pipeline of products and services continues to expand.

Life Sciences Research

We estimate the life sciences research opportunity for immunosequencing is approximately $1.0 billion globally, comprised of $150.0 million from academic researchers and $850.0 million from biopharmaceutical companies. We base this market sizing on the number of current academic researchers and biopharmaceutical clinical trials across oncology, autoimmune disorders and

infectious diseases that could benefit from immunosequencing. We anticipate this market will grow as immunosequencing continues to demonstrate clinical relevance, and we believe our penetration will deepen as we expand our customer base and move from earlier to later stage clinical trials with our existing collaborators.

Clinical Diagnostics

The current market opportunity for our clinical diagnostics portfolio is estimated to be $16.3 billion and is comprised of MRD monitoring in lymphoid malignancies and early detection in two representative indications we are currently assessing. The market opportunity for MRD monitoring is based on the more than 4.6 million newly diagnosed and surviving patients worldwide with lymphoid malignancies in which the cancerous cell is a T cell or B cell, such as MM, ALL, CLL and NHL. Taking into account geographic distinctions in pricing and testing frequency, we estimate the annual addressable market to be $1.2 billion and $3.3 billion in the United States and outside the United States, respectively. We base this market sizing on the population of both incident and prevalent patients in each disease state, the number of tests per line of therapy, the number of lines of therapy, and an estimated average selling price. We anticipate this market to continue to grow as approved therapeutics extend the lives of patients and testing can be conducted from blood samples, increasing the frequency of testing.

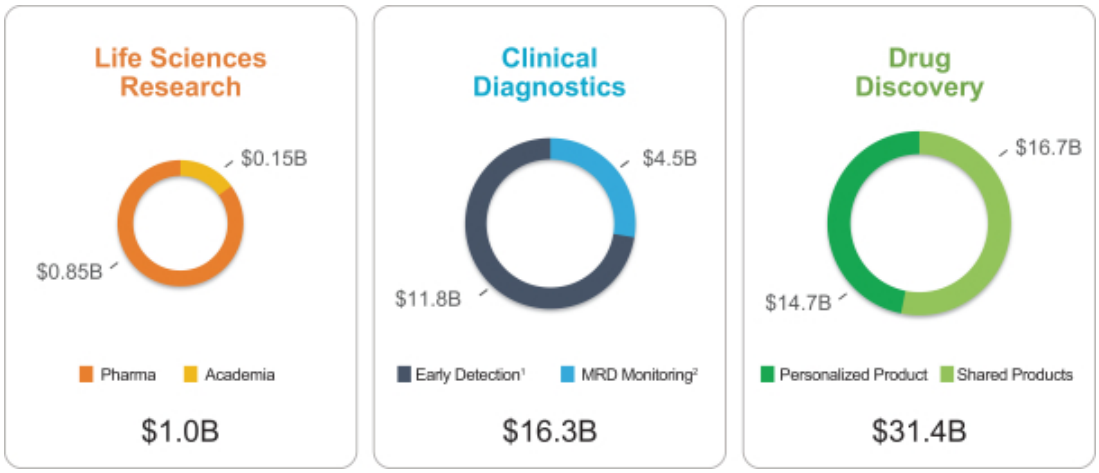
To determine the early detection opportunity for immunoSEQ Dx, while our initial indications have not yet been confirmed, we are targeting an addressable market based on two representative indications where we have developed preliminary data, celiac disease and ovarian cancer. Based on people at high risk for these representative diseases, we estimate a potential contribution of $11.8 billion to our annual addressable market. To assess the opportunity in ovarian cancer, we focus on high-risk women who are BRCA-mutation positive or who have been diagnosed or treated for breast cancer. To assess the opportunity in celiac disease, we focus on people who have undiagnosed gastrointestinal symptoms or who are first-degree relatives of people with a confirmed celiac diagnosis. In the future, if our TCR-Antigen Map enables us to read the immune system from a simple blood test, then this could potentially transform the diagnosis and treatment of disease and present one of the largest opportunities in healthcare.

Drug Discovery

The market opportunity for our Shared Products and Personalized Product being developed in collaboration with Genentech is estimated to be $31.4 billion based on over 100,000 metastatic patients with select tumor types who have at least one of the antigens that may be prioritized in the collaboration. While the Personalized Product is expected to be applicable to a broad range of tumor types, it is currently earlier in development than the Shared Products, leading to a larger expected addressable market for the Shared Products in the near term. We expect to begin discussions with the FDA during the fourth quarter of 2019, with a view to making an IND submission by the fourth quarter of 2020. Genentech will determine the actual timing of discussions with, and submissions to, the FDA.

Because our immune medicine platform enables the high-throughput discovery of clinical-grade TCRs against any type of antigen by querying hundreds to thousands of TCRs from healthy donor or patient blood, we believe we are uniquely positioned to bring the promise of cellular therapy to a broad range of cancer patients. If proven, we intend to explore expanding the market opportunity for our TCR screening approach to the development of cellular therapies in autoimmune diseases as well.

Our Addressable Market: $48.7B



1. Early detection includes ovarian cancer testing for high-risk women who are BRCA-mutation positive or who have been diagnosed or treated for breast cancer, and celiac disease testing for people who have undiagnosed gastrointestinal symptoms or who are first-degree relatives of people with a confirmed celiac diagnosis.
2. MRD monitoring in ALL, MM, CLL, and NHL globally. Assumes 2-4 MRD tests per treatment cycle depending on indication and geography.

Our Competitive Strengths

We aim to harness the inherent biology of the adaptive immune system to develop clinical products and services that improve human health by leveraging our core competitive strengths.

- *Our immune medicine platform is uniquely capable of supporting clinical products.* We have developed a platform that is capable of reading and translating the massive genetic diversity of the adaptive immune system and its selective response to disease. Specifically, our platform *sequences* immune receptors and *maps* them to antigens for diagnostic applications, *pairs* receptor chains and *characterizes* antigen-specific, paired receptors to identify optimal clinical targets for therapeutic use. We are the only company that can perform all of these functions—and we do so at an unprecedented scale to develop novel clinical diagnostic and therapeutic products.
- *Our clinical immunomics database provides a robust product development engine.* Our dynamic clinical immunomics database of over 20 billion immune receptors, now being annotated with antigens using machine learning, drives our ability to rapidly discover and develop potential diagnostic and therapeutic applications. Our aim is to translate the natural capabilities of the immune system into the clinic by capturing the millions of diverse unique receptors present in a patient's blood.
- *Clinical applicability spans diagnostic and therapeutic product potential.* Our ability to accumulate, synthesize and process billions of immunomic datapoints to generate multiple clinical diagnostic and therapeutic applications across disease areas provides optionality to our commercial pipeline. Each of our products also has broad applicability, enabling robust product lifecycle extensions.
- *Regulatory and reimbursement expertise will help inform future clinical product development.* Having successfully obtained FDA marketing authorization, and coverage for clonoSEQ from Medicare and three private payors, we believe we have developed valuable core capabilities that will facilitate future product development through to regulatory approval and

reimbursement. We believe this capability will inform future development of other clinical products, including our early detection tests.

- *Transformational collaborations with industry leaders validate our platform.* Our collaborations with industry-defining leaders such as Genentech and Microsoft validate our unique approach to advancing the promise of immune-driven medicine. We will continue to seek opportunities to optimize our ever-growing clinical immunomics database to drive product development and commercial success and facilitate efficient use of capital.
- *Strong intellectual property protects our immune medicine platform and its applications.* We have filed 375 patent applications, 234 of which have issued as of March 31, 2019, covering improvements in sequencing methods and new ways to leverage adaptive immune receptors for life sciences research, clinical diagnostic and drug discovery applications.

Our Strategy

Our focus is to leverage our immune medicine platform and competitive strengths to develop transformative clinical solutions accessible to patients around the world.

- *Advance the promise of immune-driven medicine.* We facilitate the development of the immune medicine field by providing a platform to encourage generation of immunomics data to facilitate a deeper understanding of, and biological discovery from, the adaptive immune system. We leverage the unique capability of our platform to translate a patient's immune system with the scale, precision and speed required to enable the development of personalized products, including clinical diagnostic tests for disease monitoring and early detection, as well as immune-based therapeutics.
- *Rapidly identify and advance new products, leveraging foundational technology.* Integrate proven chemistry into our clinical products in development, avoiding the need to re-engineer new products for every clinical application. We do this by serially identifying new applications of immunoSEQ Dx for early detection of disease using retrospective datasets without requiring live cells from large cohorts of patients, and by characterizing TCRs for therapeutic use. As our platform expands into new indications across cancer, autoimmune conditions and infectious diseases, we believe we will benefit from economies of scale and drive margin improvement over time.
- *Entrench our products and services in clinical drug development with biopharmaceutical collaborators.* Position our platform as the gold standard for the validation of potential immune-driven clinical discoveries in late-stage clinical trials. Since inception, our products and services have been used by more than 125 biopharmaceutical companies and incorporated into over 480 clinical trials, and clonoSEQ has proven to be the MRD test of choice for select registrational trials. To deepen our established position as a partner of choice, we provide end-to-end support, including hypothesis-driven trial design, extensive data analyses, parallel regulatory support, compliant data transfers and novel target screening. These synergistic relationships advance the development and adoption of our own clinical products and also inform drug development for our partners.
- *Drive the commercial adoption of distributed, reimbursed and regulated clinical products.* Expand distribution and drive usage of our products and services, including the development of clinical IVD kits. Leverage the commercial infrastructure built for clonoSEQ to submit clinical data for regulatory clearance of our products and services, expand current payor coverage and provide robust billing and patient access infrastructure for multiple clinical applications.
- *Maintain an entrepreneurial, scientifically rigorous, data-driven and inclusive corporate culture.* Fuel the promise and potential that our platform offers to help patients better manage their

disease by translating insights from our world-class team, which includes 79 people with medical or doctoral degrees with expertise in biology, chemistry, bioinformatics, software, drug discovery, development and commercialization, into clinical products and services. We plan to continue to expand our team to advance the promise of immune-driven medicine.

A Primer: The Adaptive Immune System

Over millions of years, the adaptive immune system has evolved an elegant solution to keeping people healthy. It recognizes and responds to most antigens, whether they come from outside the body, such as a virus, or inside the body, such as mutations that drive cancer.

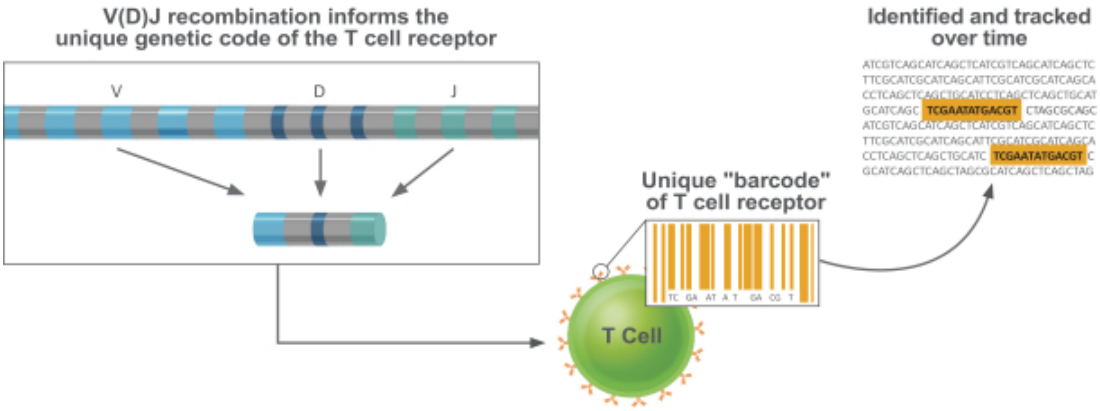
The innate and adaptive immune systems both play a role in human immunity, but only the adaptive immune system provides a specific response to signals of disease, or antigens. These disease specific antigens are primarily fragments of proteins that are recognized as foreign, such as proteins from a virus. However, antigens can be recognized as foreign even if they are not from a pathogen. In cancer cells, antigens are generated from neoantigens, which are derived from mutations specific only to the cancer, or tumor associated antigens (“TAAs”), which are from aberrantly expressed normal proteins. For autoimmune disorders, the immune system mistakenly recognizes normal protein fragments as foreign antigens and attacks otherwise healthy tissue.

The Adaptive Immune Response

The key cells of the adaptive immune system that enable our body to mount responses against antigens are called T cells and B cells. T cells can destroy target cells directly, and B cells secrete antibodies, activating other parts of the immune system to destroy targets.

Each T and B cell has a unique Y-shaped receptor, which can recognize one or a small number of the millions of antigens to which our bodies are continuously exposed. When an adaptive immune response is initiated against a particular disease, the T cells and B cells encoding the disease-specific targeting receptors rapidly multiply through clonal expansion, allowing for a powerful immune response. Some of these expanded cells directly attack the disease, and others form long-term memory to allow rapid recognition of the same antigens in the future and protect against reinfection.

Unlike all other genes in the human genome, the genetic sequences of TCRs and BCRs rearrange over time through a complex biological process resulting in massive diversity. The diversity of these receptors is made possible by a unique reshuffling of their genetic code known as V(D)J recombination (V=Variable, D=Diversity, J=Joining). This recombination process only occurs in T cells and B cells, and it results in each cell clone having a unique receptor-associated deoxyribonucleic acid ("DNA") sequence. This unique DNA sequence acts like a barcode that can be used to identify and track an individual receptor over time, as shown in the figure below:



The adaptive immune response requires millions of these unique receptors to be widely distributed and present in the blood at all times in order to have the ability to rapidly respond to many different diseases simultaneously. Even after a specific TCR binds to an antigen and clonally expands, the frequency of these expanded T cell clones containing the TCR remains relatively low in relation to the estimated trillions of other T cells that are circulating. We have demonstrated this by sequencing thousands of healthy individuals for control cohorts for our research and development efforts. We now know that disease-specific TCRs that are clonally expanded in a patient's blood are present, on average, at less than 1 cell out of 100,000 cells. Despite their relatively low abundance, disease-specific TCRs can mount a systemic, persistent response to most perturbations because of the highly specialized properties of the immune response summarized in the table below:

PROPERTY	DESCRIPTION
High sensitivity	The adaptive immune system identifies even a very small amount of antigen in the body.
High specificity	TCRs and BCRs specifically bind to this antigen or pieces of this antigen presented on cells, respectively, but normally avoid binding to features on healthy cells.
Natural amplification	Upon binding, the disease-specific T cells and B cells expand, or multiply exponentially. So, even when the amount of antigen is small, the number of disease-specific T cells can become quite large and more easily measurable.
Systemic expansion	These expanded T cells and B cells then circulate throughout the body to identify and protect the body systemically, making them readily accessible in blood and other tissues.
Persistence	A fraction of these disease-specific T cells, and the B cells that they direct, move into long-term memory and can be found in the blood decades after the disease is cleared.

In order to fully leverage these inherent properties of the immune system to develop clinical products, this enormous diversity and scale must be taken into consideration to be able to reliably and repeatedly measure the relative frequency of each disease-specific T cell in the blood. For example, cancer-specific TCRs circulating in the blood of a cancer patient are only present at 1 out of 100,000 cells. Auto-reactive T cells specific to any given autoimmune disorder circulating in the blood are only present at 1 out of 1,000,000 cells. Accordingly, the ability to detect disease-specific T cells requires a technology that can quantitatively probe a minimum of hundreds of thousands to millions of blood cells from each sample.

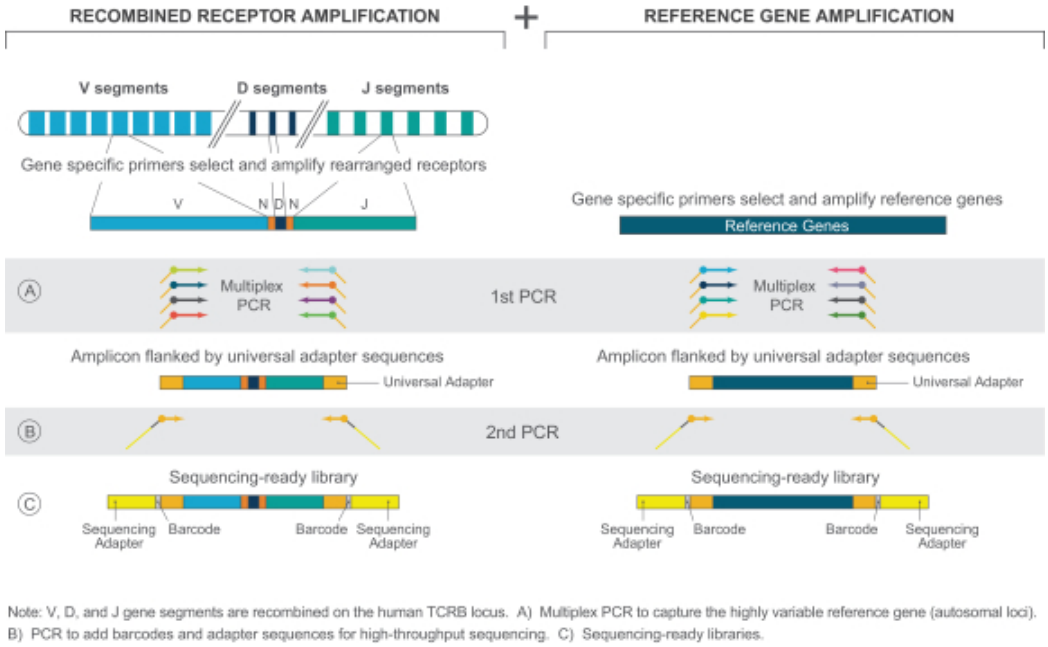
Our Immune Medicine Platform

We built a platform that can reveal and translate these properties of the adaptive immune system with the scale, precision and speed required to enable the development of personalized products, including disease monitoring, clinical diagnostic tests for early detection and immune-based therapeutics. Our immune medicine platform combines a suite of proprietary technologies, bioinformatics, software and machine learning to generate clinical immunomics data to decode the adaptive immune system and transform the diagnosis and treatment of disease.

The massive amount of data generated by our immune medicine platform is stored in our dynamic clinical immunomics database of over 30 billion immune receptors, of which we have data rights for over 20 billion. We believe the application of machine learning with Microsoft has the potential to exponentially accelerate the growth of novel insights from this database, which we expect will further inform our product development efforts.

Sequence with immunoSEQ

immunoSEQ sequences single chains of Y-shaped TCRs and BCRs using NGS. NGS generally describes several modern sequencing technologies that enable more efficient DNA and ribonucleic acid (“RNA”) sequencing than prior technologies. The key innovation in the development of immunoSEQ, pioneered by Dr. Harlan Robins and a team of leading immunologists at Fred Hutch, was a novel approach utilizing a two-step multiplex polymerase chain reaction (“PCR”) amplification process, hybridization and sequencing of rearranged TCRs to determine the sequences in millions of rearranged TCR genes, as shown in the figure below. We apply a similar approach for BCR sequencing. All of the data generated by immunoSEQ is uploaded to our clinical immunomics database and accessed through our proprietary cloud-based visualization and analytic tool called the immunoSEQ Analyzer.



Note: V, D, and J gene segments are recombined on the human TCRB locus. A) Multiplex PCR to capture the highly variable reference gene (autosomal loci). B) PCR to add barcodes and adapter sequences for high-throughput sequencing. C) Sequencing-ready libraries.

One of the biggest challenges of any multiplex PCR technique is controlling for PCR amplification bias, which is critical for accuracy. We solved for this problem by creating a synthetic immune repertoire that mimics rearranged immune receptor loci for all V and J genes. By identifying specific primers that are either under or over amplified, titrating the primer concentrations and computationally adjusting residual bias, we optimize quantitation. The accuracy and reproducibility of our bias control methodology was demonstrated in our lab and independently in a multi-center, lab-to-lab concordance study using our immunoSEQ RUO kit. The ability to generate an unbiased TCR or BCR sequencing read-out is paramount for any clinical product and will be required for the utility and reliability of clinical kits.

immunoSEQ enables us to observe the majority of receptors involved in a real human immune response, providing deep insights into a complex biological system that was previously challenging to understand.

Map with MIRA

Our proprietary MIRA technology enables the identification of TCRs specific to thousands of antigens simultaneously. The MIRA technology leverages a multiplexed, combinatorial approach to mapping TCRs to antigens in four steps:

1. Identify and query antigens of interest which can include neoantigens, tumor-associated, viral, infectious, autoimmune or other antigens.
2. Pool the antigens of interest and incubate them with immune cells from multiple donors whereby antigen specificities are determined based on the antigen pool design.
3. Sort T cells by marker of interest.
4. Match T cell clones to specific antigens based on the presence of specific sequences in designated pools.

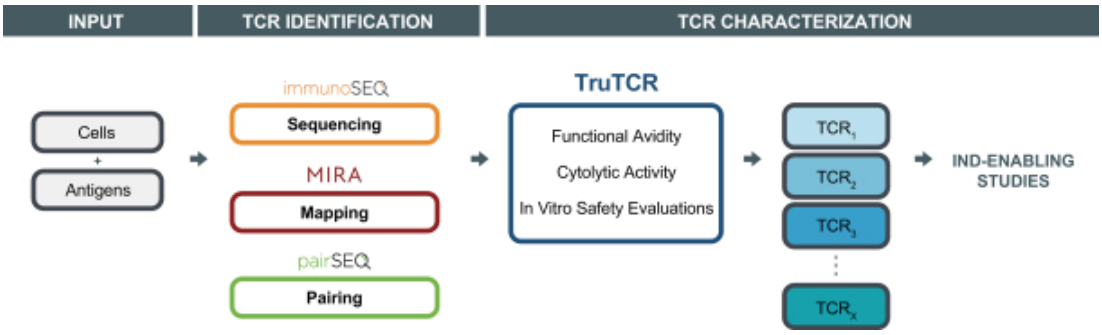
Combined with immunoSEQ, MIRA elucidates what diseases a patient's immune system has been exposed to or is actively fighting at a scale that is one thousand times more sensitive than standard immunological techniques such as ELISPOT, or enzyme-linked immunospot.

Pair with pairSEQ

Our proprietary pairSEQ technology builds on immunosequencing by using a combinatorial strategy to accurately pair the two chains of Y-shaped immune cell receptors at higher throughput than can be achieved with single cell sequencing. Pairing is difficult because the two chains of the Y-shaped receptor are located on different chromosomes, which get separated when DNA is extracted from a cell for sequencing. By pairing TCRs, we rapidly detect thousands of complete chain sequences to develop new TCR-mediated cellular therapies. Additionally, this technology may be used for downstream target discovery for novel therapies. pairSEQ has also been developed for BCRs which may enable improvements to current methods of antibody development and engineering.

Characterize with TruTCR

TruTCR characterizes binding, cytotoxicity and safety properties of antigen-specific, paired TCRs to identify a select subset that are therapeutic-grade, enabling the development of optimal clinical candidates to be engineered into TCR-mediated cellular therapies. Our comprehensive TCR characterization process utilizes advanced cellular immunology to measure TCRs against a variety of metrics to determine the optimal clinical candidates. Antigen-specific, paired TCRs undergo evaluation for avidity, cytokine release, cytotoxicity and safety. Those TCRs that pass the first safety filter are then evaluated for TCR reactivity against T cell lines and primary cells. To date, we have identified and characterized to different stages more than 1,200 unique antigen-specific TCRs against 600 different clinically relevant targets, constituting our pipeline of possible clinical candidates. TCR characterization using TruTCR is summarized in the figure below.



In collaboration with Genentech, we plan to apply a similar process to screen, identify and characterize in real-time what we believe are the most promising patient-specific TCRs targeting the patient's specific cancer antigens, advancing the next generation of cellular therapy in oncology.

Clinical Immunomics Database

We are developing a large, dynamic clinical immunomics database, which currently contains over 30 billion immune receptors, of which we have data rights for over 20 billion. We use our proprietary software and core competency in computational biology to structure and store data and to create tools for rapid analysis and easy visualization. All immunosequencing data is processed and uploaded to a secure cloud-based database.

The record of diseases a person has encountered, both past and present, is recorded in their TCR repertoire. This comprehensive disease information is contained in the immunosequencing data that we generate from each sample, which we believe will be revealed over time by our TCR-Antigen Map. We plan to map, both directly and through machine learning, an estimated 10^{15} TCRs to thousands of clinically relevant antigens, which we believe will allow us to annotate this immunosequencing data with information about disease states, increasing the value of the data over time.

We leverage our database to fuel our pipeline of immune-driven medicine products. With data rights for over 20 billion immune receptors, our platform enables us to work with retrospective samples which serve as training sets to which our Microsoft collaborators apply machine learning and computational statistics to improve the accuracy of certain of our clinical products and services.

Platform Validated by Peer-Reviewed Publications

From inception, one of our core principles has been to focus on ensuring our immune medicine platform is recognized and validated, distinguishing ourselves significantly from others in the industry. Our immune medicine platform has been used for research that has been published in over 360 peer-reviewed publications to date. These publications further validate our immune-driven applications in life sciences research, clinical diagnostics and drug discovery. In 2018 alone, our platform was leveraged to support 73 new publications, 44 of which were in high impact journals such as The New England Journal of Medicine, Nature and Cell.

Our Products and Services

Our current portfolio includes commercial products and services in life sciences research and clinical diagnostics, and we are developing products and services in both clinical diagnostics and drug discovery. Our commercial research product, immunoSEQ, primarily serves as our underlying research and development engine to develop and validate our clinical pipeline. The technologies underlying our current research and diagnostic products, immunoSEQ and clonoSEQ, respectively, leverage the sequencing and tracking capabilities of our immune medicine platform and comprise our sequencing revenue. Our pipeline of clinical diagnostics for early detection and our TCRs for drug discovery are informed by the mapping function of our platform, which we are optimizing with Microsoft's machine learning capabilities. The selection of TCRs for drug discovery also leverages the pairing and characterization components of our platform. We plan to rapidly scale our drug discovery efforts in 2019 to expedite the path to the clinic for the cellular therapy product candidates we are developing in collaboration with Genentech, which generates most of our development revenue. We plan to continue to invest in our platform to develop additional clinical applications, which we prioritize based on rigorous data requirements for clinically actionability, unmet medical need and commercial viability.

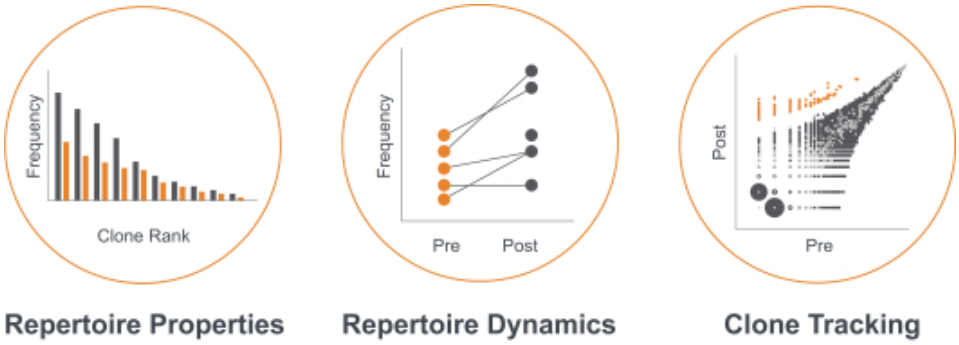
Life Sciences Research

immunoSEQ for Research Use Only

Our immunoSEQ technology, which we offer to customers as a service and a kit, is the core of our immune medicine platform. immunoSEQ utilizes multiplex, bias-controlled PCR to accurately and quantitatively sequence millions of immune receptors at high-throughput directly from DNA. We believe immunoSEQ is positioned to become the global standard for immunosequencing due to the quality and reliability of our data and the analytics and data visualization tools that are easily accessible to customers in the immunoSEQ Analyzer, whether sequenced as a service or a kit.

Since inception, immunoSEQ has been used for research purposes by over 2,000 academic researchers and more than 125 biopharmaceutical companies and incorporated into over 480 clinical

trials to answer translational research questions relating to the adaptive immune system, monitor response to therapies and discover new prognostic and diagnostic signals. These research questions are answered by using the data generated by immunoSEQ and uploaded to the immunoSEQ Analyzer to study different properties and dynamics of all of the sequences in an immune repertoire, such as frequency or abundance, and by tracking specific sequences over time in clinical trials. Graphical representations of the Analyzer output are shown in the figure below:



immunoSEQ provides a growing revenue stream. However, we also use immunoSEQ as the foundational technology for our clinical diagnostic and therapeutic products. To fuel innovation, we also provide immunoSEQ to select research and development collaborators who gain access to immunoSEQ and significant computational and analytical support, co-share and co-publish the data with us, and contribute to the validation of potential clinical diagnostic discoveries. For example, we work closely with our collaborators to conduct translational research to explore the use of immunosequencing to predict responders to novel immunotherapies such as checkpoint inhibitors.

Our immunoSEQ Analyzer is housed on a secure cloud-based database and is the visualization gateway to our clinical immunomics database that currently has billions of TCR and BCR sequences which are often annotated and accompanied by samples with associated metadata. We offer computational services to assist our customers in realizing the power of their data and to compare their data to other publicly available datasets in our clinical immunomics database. We contribute some of our own research and development sequences into the publicly available datasets and customers are offered the option to make their data public using one of our tools on our immunoSEQ Analyzer, called immuneACCESS, through which researchers can expedite and streamline the peer-review process by sharing their data with reviewers prior to manuscript submission. The ongoing analysis of immune receptor data from an expanding database tagged with clinical metadata, when possible, has led to approximately 360 peer-reviewed publications referencing immunoSEQ and potential clinical signals to explore.

In 2018, we launched an improved version of immunoSEQ to our research customers and we expect to incorporate these chemistry changes into a new RUO kit. Importantly, we expect this service and kit offering to become the technology upon which we clinically validate the early detection diagnostics we are developing using our TCR-Antigen Map. These changes will further enhance the quantitation of the data and allow for any sample type to be used, including stored cancer tumor tissue sections, which is more readily available globally amongst researchers in the field of cancer immunotherapy.

Strategy to Become a Standard for Immunosequencing

To become the global standard for immunosequencing, we are focused on several key commercial initiatives:

- *Offer a clinical-grade research product.* We are working to analytically validate the improved version of immunoSEQ so that all research data generated using immunoSEQ can be used for clinical validation of potential diagnostic applications.
- *Deepen relationships with existing customers.* By delivering reliable and meaningful results, we aim to move from earlier to later stage clinical trials and from a focus in oncology to other disease states, with the potential for conversion from fee-for-service to diagnostic and translational collaborations.
- *Create ubiquity through broad global reach.* We are actively seeking distribution partners to drive availability and adoption of our improved immunoSEQ RUO kit by researchers who want to perform immunosequencing in their local labs.
- *Develop accreditation program for high-complexity labs to run immunoSEQ.* In addition to growing our prospecting and collaboration efforts with our biopharmaceutical customers, we are also considering enabling select high-complexity labs to run the sequencing portion of our RUO product in an effort to broaden the inclusion of immunosequencing in non-registrational clinical trials.

Clinical Diagnostics

We aim to be a global leader in immune-driven diagnostics for early detection, prognosis and monitoring of disease, which represents an estimated $16.3 billion market opportunity for our early products and services. To achieve this long-term goal, we are focused on leveraging the sequencing and mapping functions of our immune medicine platform to develop diagnostic tests that meet regulatory standards, are widely reimbursed and are accessible to patients all around the world.

Monitoring MRD with clonoSEQ

Our first diagnostic product, clonoSEQ, is an FDA-authorized test for the detection and NGS-based monitoring of MRD in bone marrow samples in patients with MM and ALL. In these blood cancers and others, such as CLL and NHL, the malignant cell is derived from a T cell or B cell. MRD refers to the presence and number of these malignant T or B cells that may remain in a patient's body during and following treatment. Because our technology quantifies the frequency of every T cell or B cell in a sample, we can monitor MRD accurately at a sensitivity of 1 out of 1,000,000 cells, given sufficient sample input. By taking a baseline measurement prior to starting therapy and then tracking the number of cells at several time points following therapy initiation, hematologists can improve their ability to detect relapse early, help predict patient outcomes and monitor response to therapy.

NCCN Guidelines recommend using a validated test to measure MRD to define the burden of disease and assess response to therapy in MM and ALL after each treatment stage. NGS-based MRD testing has been added to these guidelines and we plan to seek expansion of the recommendations to include additional time points in each disease state and to incorporate clonoSEQ specific data.

MRD monitoring is becoming increasingly important in the hematologic oncology field because highly effective new therapies are extending survival. This has created a need for more sensitive tools to monitor the disease status of patients over longer periods of time and has introduced the potential for MRD to be included as a surrogate or primary endpoint in registrational clinical trials. We believe we are uniquely positioned to benefit from these industry dynamics with both our clinical and biopharmaceutical customers.

clonoSEQ testing has been ordered by clinicians in nearly 300 healthcare systems and institutions, including 27 of the 28 NCCN centers in the United States. We believe increased adoption of clonoSEQ will now be possible due to the recent Medicare coverage decision in January 2019 to assess MRD at multiple time points throughout therapy in MM and ALL, and the subsequent coverage from three private payors representing approximately 68 million covered lives. Due to our FDA marketing authorization, we believe clonoSEQ will remain the preferred commercial test among biopharmaceutical companies using MRD in their registrational trials. In addition, clonoSEQ is being used by more than 30 biopharmaceutical companies in over 120 clinical trials. To continue demonstrating clinical utility across disease settings and lines of therapy, clonoSEQ is also being used in 40 ongoing prospective investigator-led clinical trials, and our MRD data have been included in over 38 peer-reviewed publications.

clonoSEQ is also currently available as an LDT for use across lymphoid malignancies and sample types, including those which are not yet authorized by the FDA. We intend to file for regulatory clearance in additional indications and sample types, with at least one planned submission for CLL in 2019.

The Technology

clonoSEQ is our FDA-authorized, NGS-based MRD technology that is designed to sequence all rearranged receptor sequences in a tumor in parallel to ensure accurate, sensitive and robust MRD monitoring.

A summary of the steps for FDA-authorized usage is as follows:

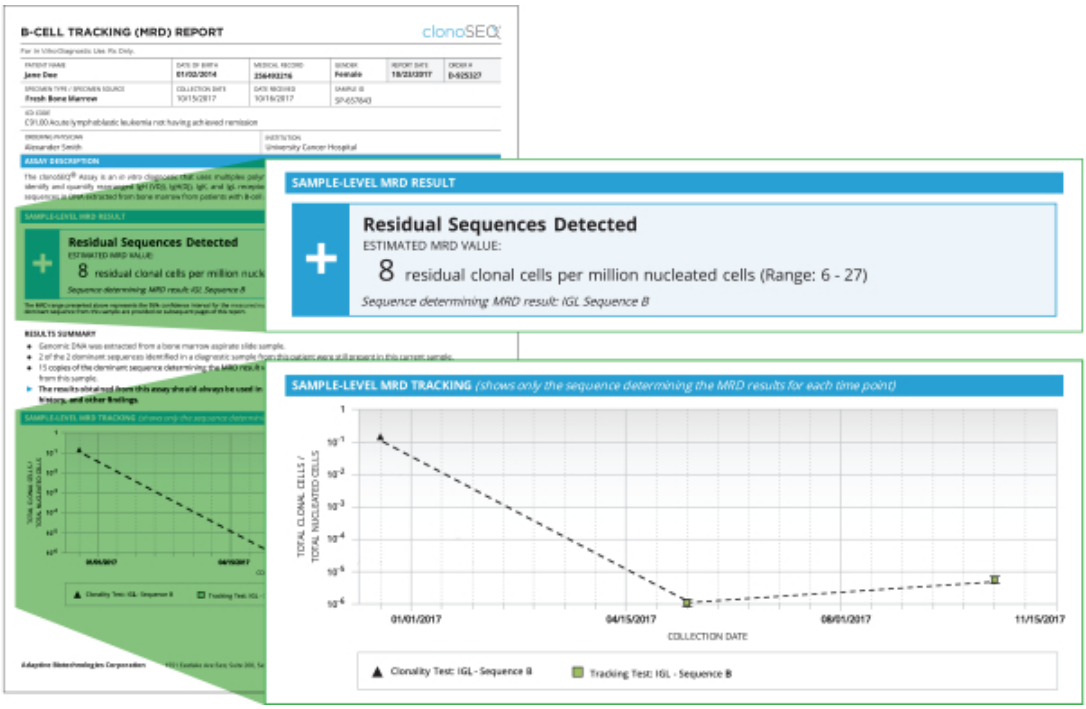
1. gDNA is extracted from bone marrow.
2. Extracted DNA quality is assessed, and rearranged immune receptors are amplified using a multiplex PCR.
3. Reaction-specific index barcode sequences for sample identification are added to the amplified receptor sequences by PCR.
4. Sequencing libraries are prepared from barcoded amplified DNA which are then sequenced by synthesis using NGS.
5. Raw sequence data are uploaded from the sequencing instrument to our analysis pipeline.
6. Sequence data is analyzed in a multi-step process, where a sample's sequence data is first identified using the sample index sequences and the data is then processed using a proprietary algorithm with in-line controls to remove amplification bias.
7. Following completion of these data processing steps, a report is issued.

Clinical Report Forms

Patient test results can be accessed by the ordering physician within seven days for fresh specimens, or 14 days for stored specimens, of receiving the sample in our lab in Seattle, Washington via our secure ordering portal and can be incorporated into the patient's medical record. There are two clonoSEQ report forms:

- A Clonality or ID Report that identifies and quantifies DNA sequences specific to "dominant" clone sequences consistent with the presence of a lymphoid malignancy. This is the report that is issued upon initial testing.

- A Tracking MRD Report which is provided at multiple points in time when the patient is re-tested and the previously identified dominant clone sequences are detected and quantified to determine the sample MRD level which can be compared to the MRD level at previous time points.



Adaptive Assist: Patient support program

Adaptive Assist is our patient support program to facilitate access to clonoSEQ testing services for patients who could benefit from the clinical insights provided by NGS-based MRD testing. Patients can call to discuss their individual circumstances with one of our dedicated patient support representatives in order to better understand their coverage prior to clonoSEQ testing and to navigate the insurance process, including appeals for denied claims. We also offer financial assistance for qualified uninsured and under-insured patients who cannot afford their patient financial responsibility for clonoSEQ.

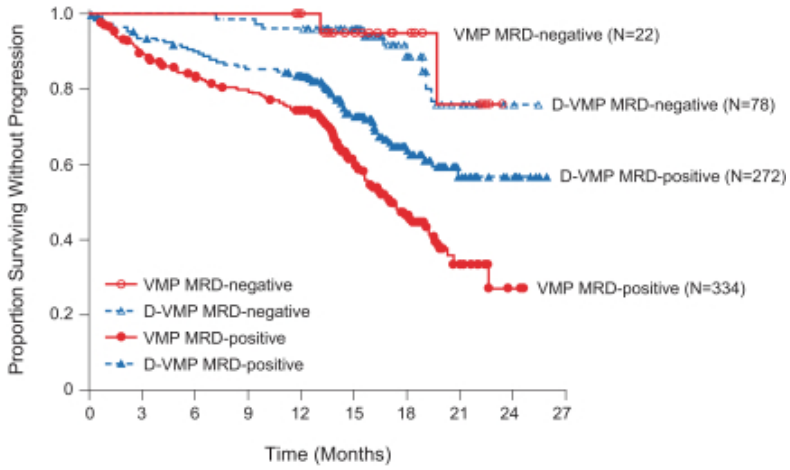
Clinical Validation in FDA Filing for MM and ALL

Our clonoSEQ test has been shown to help better predict patient outcomes and add insight to the evaluation of disease response to therapy because we have clinically validated clonoSEQ's ability to detect MRD at a sensitivity greater than the current recommended clinical standard for all lymphoid malignancies. clonoSEQ has demonstrated sensitivity of 1 out of 1,000,000 cells (10^{-6}), given sufficient sample input, which is a deeper resolution than the current accepted standard of 1 out of 100,000 cells (10^{-5}) or 1 out of 10,000 cells (10^{-4}) for MM and ALL, respectively. Based on these results, as further illustrated below, we believe clinical standards for MRD sensitivity may be increased to 10^{-6} to better predict patient outcomes.

Clinical validation in MM was demonstrated in two studies. The first study, a 720 patient, randomized phase III trial conducted at the Dana Farber Cancer Institute (DFCI 10-106), evaluated the ability to predict progression-free survival ("PFS") and disease-free survival in patients who achieved complete response ("CR") and the ability to predict PFS in all evaluable patients. This study demonstrates that MRD negativity for patients in CR significantly predicts PFS.

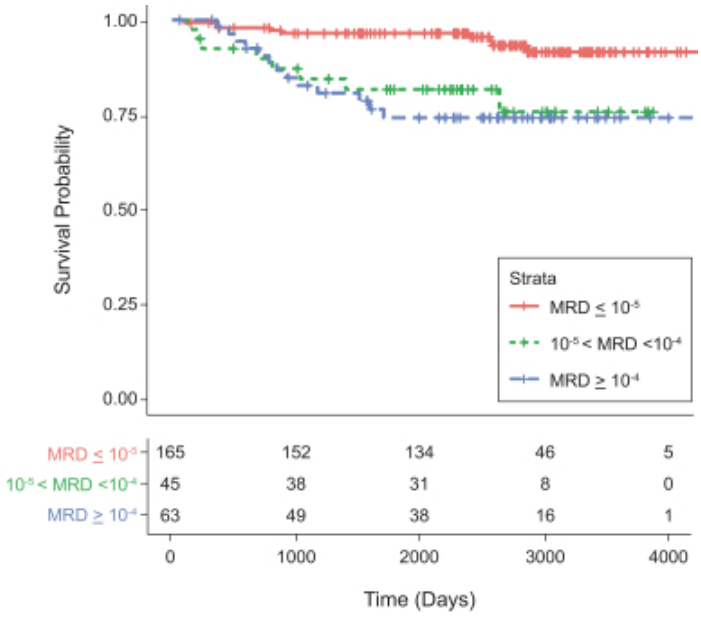
The second study, a 706 patient, randomized phase III trial sponsored by Janssen Biotech, Inc. ("ALCYONE"), evaluated Darzalex in patients with newly diagnosed MM who were transplant ineligible and served as the basis of the approval of Darzalex in combination with Bortezomib, Melphalan and Prednisone ("VMP") in this patient population. This study provides evidence that our clonoSEQ diagnostic test is predictive of PFS, regardless of treatment received. Patients who were MRD negative at less than or equal to 10^{-5} had longer PFS and the group with persistent MRD negativity had the longest PFS overall.

Patients who were MRD negative by the clonoSEQ Assay had longer PFS compared to MRD positive patients regardless of treatment.



Clinical validation in ALL was demonstrated in two Children's Oncology Group studies, AALL0232 (high risk) and AALL0331 (standard risk) by evaluating the ability of clonoSEQ to predict event-free survival ("EFS") at a primary cutoff of 10^{-4} and across a continuous MRD measure. Results demonstrate that patients with the lowest levels of MRD have better outcomes than patients with higher disease burden regardless of risk stratification.

Patients with lower levels of MRD (less than 1/100,000 cells), using the increased sensitivity of clonoSEQ, have a higher probability of EFS.



Strategy to Achieve Market Leadership

We aim to drive adoption and achieve market leadership for MRD monitoring with clonoSEQ for all lymphoid malignancies. To do so, we are executing against the following strategic initiatives:

- *Expand reimbursement with public and private payors.* We are working with payors to develop appropriate coverage policies, generate healthcare economic information and provide robust billing and patient access infrastructure. Following our established Medicare coverage for clonoSEQ in its current FDA-authorized indications, and the subsequent coverage from three private payors representing approximately 68 million covered lives, we expect to seek broader coverage in line with our planned FDA label expansions. We continue to invest in health economic research and real-world evidence to demonstrate the benefits of including MRD testing across indications.
- *Entrench clonoSEQ in biopharmaceutical clinical trials.* As the industry pursues the inclusion of MRD as a potential surrogate or primary endpoint in clinical trials for lymphoid malignancies, having a standardized and highly accurate and sensitive option for MRD testing to guide clinical decisions in late stage trials, including registrational trials, is valuable. Our goal is to position clonoSEQ for use by our biopharmaceutical collaborators as the MRD test of choice for these clinical trials.
- *Validate clonoSEQ in additional indications for use.* With the end goal of clonoSEQ becoming a universal MRD test for all lymphoid malignancies, we have developed a robust lifecycle development plan to generate sufficient clinical evidence to support the extension of the FDA label beyond ALL and MM. We are accumulating clinical data in CLL, and we have plans to submit these data to the FDA in 2019.
- *Validate clonoSEQ in blood to offer a minimally invasive alternative.* We expect to also submit data to the FDA in 2019 to add blood as a validated sample type to our FDA label, which would

enable more frequent monitoring of patients over longer periods of time. Testing with blood is less invasive and less expensive as compared to MRD testing from bone marrow samples, and it may only be possible because of the deep sensitivity of our clonoSEQ diagnostic test.

- *Invest in an experienced, specialty salesforce.* We are building a sales organization to target key customer segments, including academic centers, integrated health networks and community clinicians, in a tiered manner based on patient volume. In 2019, we are focused on Tier 1 and Tier 2 accounts, which we estimate to drive 75% of the market potential. As coverage expands and usage builds, we have designed multiple field sizing scenarios to drive uptake in Tier 3 and Tier 4 accounts.
- *Develop a decentralized testing solution.* We are developing a clonoSEQ IVD kit which we intend to sell to trained high complexity molecular labs to service the MRD opportunity in regions where local testing is needed or required. Between now and the launch of the clinical IVD kit, we plan to scale up our investment in physician education to establish the need for a fully standardized MRD solution.
- *Expand internationally.* To enter European markets, we plan to transfer our technology to select centers to conduct investigational studies that are essential for reimbursement submissions. We have already completed one successful technology transfer in Toulouse, France in 2017 and expect to continue expanding this program to select sites in 2019. We also plan to seek a CE mark for clonoSEQ in 2019 to enhance our reimbursement efforts in Europe. We expect these market development activities to prepare us to launch the clonoSEQ IVD kit in markets outside the United States over the next three to five years.

Early Detection with immunoSEQ Dx

By learning to read the antigen specificity of a patient's immune system, we are developing the immunoSEQ Dx diagnostic test for early detection across a broad range of diseases, including certain prevalent cancer types and autoimmune disorders. We believe the adaptive immune system presents an ideal model for diagnostic tools for early detection of disease. Treatment is typically most effective early in the course of a disease, when there is a minimal amount of disease-specific antigen present. TCRs recognize this very small amount of antigen before it is detectable by conventional methods and then they expand exponentially. Given this large response in proportion to the amount of antigen present, we believe we will be able to see this signal of disease much sooner than is possible with other methods of early disease detection.

We are leveraging our existing immunoSEQ technology to develop immunoSEQ Dx for the early detection of many diseases simultaneously. This is possible because our platform works with retrospective sample sets and uses machine learning and computational statistics to continuously improve accuracy without requiring large cohorts of prospective patients. Before pursuing broad population screening tests, however, we are initially developing immunoSEQ Dx for the early detection of specific disease states that meet the following criteria:

- Clinically relevant antigens are known and understood.
- High unmet medical need for diagnosis.
- Potential to improve patient outcomes with early intervention.
- Availability of sample sets with patient outcomes.

We have initially chosen to pursue a small subset of indications that meet these criteria which together represent an estimated $11.8 billion of the addressable market we describe for our diagnostic opportunities. Our goal is to generate a confirmatory clinical signal for one or more of these indications

in 2019 for expected submission in 2020 and to run analytical validation studies for the technology in parallel. We plan to repeat this process for additional disease states as we expand our knowledge about the antigen specificity of millions of TCRs in our clinical immunomics database. Using these clinical signals and validation studies, we then plan to pursue FDA approval of immunoSEQ Dx in one or more of these initial indications as an IVD conducted in our CLIA certified, CAP-accredited, ISO 13485-certified laboratory. We believe the same blood test will ultimately be able to be used to detect multiple diseases simultaneously.

The TCR-Antigen Map

In order to detect disease from a blood sample, the TCRs sequenced by immunoSEQ must be annotated with their disease-specific antigens by cross-referencing our TCR-Antigen Map in the cloud. We are building our TCR-Antigen Map as part of our strategic collaboration with Microsoft established in December 2017. Together we are using immunosequencing, proprietary computational modeling and machine learning to map TCR sequences to the antigens they bind. Using these data, we aim to translate the natural diagnostic capability of the immune system into the clinic.

Proof of Concept

For proof of concept of the ability of our technology to detect infectious disease exposure in patients, our researchers profiled the T cell repertoire of more than 660 subjects with known cytomegalovirus (“CMV”) status and identified a set of TCRs across that population that are specific for CMV. This set of CMV-specific TCRs was then tested as a method for CMV diagnosis in a new cohort of 120 people. Using this TCR set, we were able to confirm CMV infection in up to 93% of blood samples evaluated. These data represent a significant step forward for the potential use of TCR sequences to detect exposure to pathogens or other diseases with distinct T cell profiles.

By combining the power of our clinical immunomics database with a machine learning technique known as pseudo-labeling, we are rapidly scaling the identification and validation of antigen-specific TCRs for diagnostic applications. For example, we have already iteratively scaled the identification of additional CMV-specific TCRs to improve the diagnostic accuracy in our proof of concept study to 98% with a minimal false positive rate. We believe this approach has the potential to significantly reduce the time and number of individuals, and ultimately the cost, required to accurately validate our clinical diagnostics across different diseases.

Strategic Plan to Evolve Early Detection of Disease

To achieve our goal of developing a diagnostic test for early detection across a broad range of diseases, we are pursuing the following strategic steps:

- Apply machine learning to high-throughput mapping to generate the TCR-Antigen Map.
- Demonstrate proof of concept for early detection using mapped TCRs in select indications.
- Launch one TCR sequencing technology, immunoSEQ Dx, for initial indications.
- Broaden utility to a wide range of diseases without requiring large prospective trials.

Drug Discovery

Our aim is to develop immune-mediated therapies in oncology and other disease areas by using the full functionality of our immune medicine platform, including TruTCR for TCR characterization. We are currently working to leverage our TCR discovery capabilities to enable commercialization of novel therapies by collaborators. In the future, we may explore expanding our end-to-end capabilities for the development of cellular therapies and vaccines.

TCR Discovery for Cellular Therapy

We have developed a high-throughput TCR screening process that allows for the discovery of antigen-specific TCRs that occur in low frequencies in healthy individuals. We believe this provides a set of naturally-occurring TCRs with a more favorable safety profile in comparison to engineered TCRs. We then further characterize these naturally-occurring TCRs for binding avidity and cytotoxic potency. To date, we have identified and characterized to different stages more than 1,200 unique antigen-specific, paired TCRs against 600 different clinically relevant targets, constituting our pipeline of possible clinical candidates. We complete a data package for each characterized TCR that we believe meets the thresholds for therapeutic evaluation. These thresholds are divided into a series of seven key steps covering antigen specificity, functional avidity, cytolysis and safety assessment. A package is considered complete when the TCR meets the rigorous criteria for all seven steps and the data are compiled to support an IND package. As a proof of concept, we compared our fully characterized TCR against WT-1, a TAA often overexpressed in various cancers, to a benchmark WT-1 TCR. A gold standard for testing TCR efficacy is killing of cells that naturally express the target antigen at low levels. Using a cancer cell line that is known to express low levels of WT-1, our candidate WT-1 TCR was over four times more effective at killing cancer cells than the benchmark TCR. The complete data package for our lead WT-1 TCR candidate demonstrates improved avidity, cytolysis and a promising safety profile.

Our high-throughput screening technologies enable us to discover TCRs against any type of antigen which opens up the potential to develop novel TCR-mediated cellular therapies for any type of cancer. As compared to cellular therapies that target T cell surface antigens that are not specific to cancer, we believe our approach to TCR cellular therapies may mitigate the risk of off-target side effects. Therefore, we believe our approach may be applicable to the vast majority of solid tumors, even those where the tissue of origin is vital to survival such as lung or renal.

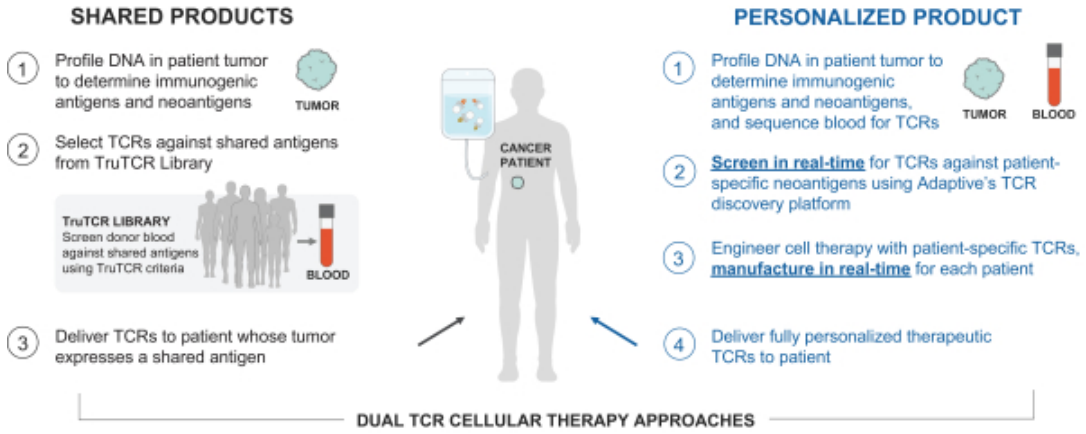
In December 2018, Genentech selected our platform to develop, manufacture and commercialize novel neoantigen directed T cell therapies for the treatment of a broad range of cancers. Our ultimate goal is to harness the vast majority of therapeutically relevant, patient-specific TCRs against neoantigens and advance the next generation of cellular therapies in oncology. We believe our TCR discovery capabilities may also facilitate the development of cellular therapies in disease areas beyond cancer, which we can commercialize outside of the Genentech collaboration.

In addition to cellular therapy applications, we believe our TCR screening capabilities can guide the design and development of next-generation vaccines by characterizing the immunogenicity of hundreds of antigens at a time. Our platform can also be used to then monitor early signs of antigen-specific immune response in patients treated with novel vaccines.

Strategic Collaboration with Genentech

Through our worldwide collaboration and license agreement with Genentech, we plan to develop, manufacture and commercialize novel neoantigen directed T cell therapies for the treatment of a broad range of cancers to advance the next generation of cellular therapies in oncology. We are pursuing two product development pathways for novel T cell immunotherapies in which Genentech intends to use TCRs screened by our immune medicine platform to engineer and manufacture cellular medicines:

- *Shared Products.* The Shared Products will use “off-the-shelf” TCRs identified against cancer antigens shared among patients.
- *Personalized Product.* The Personalized Product will use patient-specific TCRs identified by real-time screening of TCRs against cancer antigens in each patient.



Under the terms of the agreement, we received a $300.0 million initial upfront payment in February 2019, and we are eligible to receive approximately $1.8 billion in aggregate milestone payments upon achievement of specified development, regulatory and commercial milestones. Additionally, we may receive royalties on sales of products commercialized under that agreement. Genentech will be responsible for clinical, regulatory and commercialization efforts. We will be responsible for the screening and identification of TCRs that can most effectively recognize and directly target specific cancer antigens, including neoantigens.

In parallel, we plan to evaluate an investment in facilities for the screening of patient-specific TCRs to shorten the time from patient blood draw to infusion of the Personalized Product. We believe this investment would position us to potentially pursue additional opportunities outside of this collaboration, including developing and commercializing cancer vaccines and cellular therapies in other disease states.

Our People and Culture

Our employees, internally referred to as “Adapters,” are passionate about immune-driven medicine, empowered by scientific discipline and fueled by our foresight and curiosity about the adaptive immune system.

As of March 31, 2019, we had 346 full-time employees of which 154 had advanced degrees, including 79 who hold medical or doctoral degrees. None of our employees are subject to a collective bargaining agreement and we have not experienced any work stoppages. We believe relations with our employees are good.

Our talented employees drive our mission and share core values that both stem from and define our culture, which plays an invaluable role in our execution at all levels in our organization. Our core values are used in candidate screening and in employee evaluations to help reinforce their importance in our organization:

- *Make it happen.* Individual ownership and accountability keep us moving forward.
- *Innovate fearlessly.* Push against boundaries and think boldly to achieve world-changing results.
- *Debate openly.* Value discussions inspired by different points of view.

- *Work together.* Demonstrate you care about the success of others. The same goes for our partners and customers—together we can achieve more.
- *Follow True North.* Show up with integrity and do the right thing.
- *Have fun.* Fun makes everything better.

We believe our employees are highly engaged, and we were recognized by the Puget Sound Business Journal as one of Washington State's Best Places to Work in 2018.

Strategic Collaborations and Other Agreements

Genentech Agreement

In December 2018, we entered into the Genentech Agreement to develop, manufacture and commercialize novel neoantigen directed T cell therapies for the treatment of a broad range of cancers. Pursuant to the Genentech Agreement, we are responsible for the screening and identification of TCRs that can most effectively recognize and directly target specific neoantigens, while Genentech is responsible for clinical, regulatory and commercialization efforts. During the term of the Genentech Agreement, we have agreed to certain defined exclusivity obligations or restrictions with respect to the development and commercialization of certain cell therapies.

In February 2019, we received a $300.0 million upfront payment from Genentech. We are also eligible to receive more than $1.8 billion over time, including payments of up to $75.0 million upon the achievement of specified regulatory milestones, up to $300.0 million upon the achievement of specified development milestones, and up to $1.4 billion upon the achievement of specified commercial milestones. Genentech will also pay us tiered royalties at a rate ranging from the mid-single digits to the mid-teens on aggregate worldwide net sales of the Shared Products and the Personalized Product arising from the strategic collaboration, subject to certain reductions, with aggregate minimum floors.

The Genentech Agreement will continue until the expiration of all royalty payments, but may be terminated by mutual agreement, upon an uncured material breach by either party, upon insolvency of either party, or by Genentech for convenience upon prior written notice.

Microsoft Agreement

In December 2017, we entered into the Microsoft Agreement to map TCR sequences to the antigens they bind with the goal of developing diagnostic tests for early detection of many diseases from a single blood test.

Pursuant to the Microsoft Agreement, Microsoft applies machine learning and computational statistics to our clinical immunomics data in order to produce predictive models that allow us to map TCR sequences to the antigens they bind. Under the Microsoft Agreement, we retain all rights to these predictive models and the data underlying our TCR-Antigen Map, including the right to commercialize clinical products using our TCR-Antigen Map. We and Microsoft have granted each other certain licenses to one another's intellectual property rights and have agreed to certain defined exclusivity obligations with respect to collaborations and projects that are substantially similar to the Microsoft Agreement.

During the term of the Microsoft Agreement, we have agreed to exclusively use Microsoft's Azure cloud services at standard volume pricing with a minimum Azure consumption requirement. We have also agreed to host each diagnostic product developed as a direct result of the Microsoft Agreement on Azure throughout the term of the Microsoft Agreement and for a period of five years thereafter. In addition, we have agreed to exclusively use Microsoft's immunomics artificial intelligence services for TCR-antigen mapping in connection with all of our technology, products and services developed as a direct result of our collaboration with Microsoft throughout the term of the Microsoft Agreement.

The Microsoft Agreement has a seven-year term and may be terminated by mutual agreement or by either party upon an uncured material breach. Concurrently with entry into the Microsoft Agreement, Microsoft purchased shares of our Series F-1 convertible preferred stock.

Processing and Manufacturing

We process both clinical and research use samples in our laboratory in Seattle, Washington. Our Seattle laboratory is CLIA certified, CAP-accredited and ISO 13485-certified. After we intake samples sent to us from healthcare providers or research and biopharmaceutical customers, we extract DNA from the sample if required, amplify it and otherwise prepare it for our sequencing and data analysis. Throughout our processes, we apply a rigorous quality management system, which is designed to comply with the QSR and the requirements of CLIA, CAP and other applicable state licensing and accreditation requirements.

In order to process samples submitted to us using immunoSEQ or clonoSEQ, we utilize a combination of proprietary primer mixes and commercial materials, including a multiplex PCR master mix, enzymes, high throughput multi-cycle sequencing reagents and other materials, which we obtain and assemble as needed from various third-party vendors on customary terms. A number of our processing steps utilize automated equipment to help ensure consistency and efficiency. Sequencing is performed using the Illumina NextSeq System, which we have appropriately qualified for the intended uses of our products and services. We also work with a third-party vendor to manufacture our immunoSEQ RUO kit using our proprietary primer mix and other materials.

For our TCR-Antigen Map and drug discovery initiatives, we conduct our current operations at our laboratories in Seattle, Washington and South San Francisco, California. These laboratories have cell sorting, tissue culture and other processing equipment.

We use a limited number of suppliers, or in some cases single suppliers, for our laboratory equipment and materials. We manage this concentration risk by targeting levels of surplus stock that, we believe, would allow us to locate alternative suppliers if needed. However, if one of our suppliers fails to perform adequately or fulfill our needs, we may be required to incur significant costs and devote significant efforts to find new suppliers and may face delays in processing samples or developing and commercializing our products and services. In particular, we have purchased the Illumina NextSeq System, and Illumina also supplies us with reagents that have been designed for use solely with this sequencer. While we acquire these reagents from Illumina on customary terms, if we had to replace the reagents we use we may also need to acquire and qualify a replacement sequencer, validate the reagents and potentially revalidate aspects of our existing assays.

Distribution

We processed our first immunoSEQ samples in 2011 and issued our first clonoSEQ report in 2013. Since then, we have focused on expanding our customer base. We sell our products and services primarily through our own internal sales force. Our sales and marketing efforts are targeted at department heads, laboratory directors, principal investigators, core facility directors, clinicians, payors and research scientists and pathologists at leading academic institutions, biopharmaceutical companies, research institutions and contract research organizations. We seek to increase awareness of our products and services among our target customers through direct sales calls, trade shows, seminars, academic conferences, web presence and other forms of internet marketing. Our drug discovery efforts are focused on large biopharmaceutical companies.

We intend to launch an improved RUO kit that can be used with various sample types, which we expect to enable global distribution of our research product. We plan to utilize a third-party global

distributor. We may not be able to engage a distributor in a timely manner or on commercially reasonable terms.

Intellectual Property

We have an extensive global portfolio of intellectual property rights to protect our immune medicine platform, the products and services that draw on it and our reputation in the industry.

As of March 31, 2019, we owned or controlled 343 active patents and patent applications whose claims are intended to cover what we do, what we plan to do and what others might do to compete with us. From our earliest patent filings in 2009, our portfolio has been tailored to reflect our efforts to harness the adaptive immune system for research, diagnostic and therapeutic applications. Our patent claims extend to not only adaptive immune receptor molecules, but also to uniquely powerful techniques for sequencing immune cell receptors, determining clonality and immune competency, diagnosing disease, predicting responses to immunotherapy and identifying new drug candidates. Our patent protections generally expire in years ranging from 2029 to 2038.

Critical know-how we develop is protected by a trade secrecy program to ensure against inappropriate disclosure or use. Encompassed in our know-how is our proprietary database of coding sequences, antigen reactivities and safety profiles for immune receptors, which is vast and growing. Even with collaborators, access to our immune medicine platform technology is limited and tightly controlled through contracts and careful communication. We own our immune medicine platform, including improvements we or collaborators make to it, and retain rights in data resulting from its use.

We also pursue trademark registration for our product and service names and promotional slogans in our existing and projected markets.

Intellectual Property Portfolio by the Numbers

As of March 31, 2019, our intellectual property portfolio consisted of the following:

- 375 patent applications filed worldwide directly or in conjunction with a co-owner or licensor since 2009;
- 109 pending patent applications;
- 234 issued patents across our immune medicine platform;
- 24 patent families directed to methods and tools useful in our immune medicine platform for non-target specific immunosequencing and research, including immunoSEQ;
- 10 patent families directed to methods and tools useful in diagnosis, prognosis and disease monitoring, including clonoSEQ and the TCR-Antigen Map;
- 12 patent families directed to methods and tools useful in drug discovery, including TruTCR, MIRA and pairSEQ; and
- 19 trademarks registered and pending registration worldwide.

Patent Portfolio

We have developed an expansive patent portfolio in commercially important markets with claims to critical aspects of our technology, beginning with our first patent applications exclusively licensed from Fred Hutch in 2009. Our ongoing patent strategy is to generate a return on our patenting investments, which values substantive quality over volume to build a defensible moat around technology we use as well as what others might develop to design around our position.

We prioritize pursuing patent claims with a reasonable likelihood of being granted. Where patentability for a particular invention is questionable, we often choose to protect it as a trade secret instead. In some instances, however, we may seek to push the patentability envelope when the state of the applicable patent laws are in flux, such as patent eligibility for naturally occurring molecules, including TCRs, in the United States.

Methods of Measuring Adaptive Immunity

In 2009, a U.S. provisional patent application was filed to pursue protection for immunosequencing by our Co-Founder, Dr. Harlan Robins. The invention broadly relates to methods for assessing the adaptive immune system status of individuals. Rearranged V and J segment genes of TCRs or BCRs are targeted as biomarkers for assessing the status of the immune system at one or more points in time. Granted claims extend to the use of particular sets of amplification primers, while pending claims are being pursued to capture additional assessment techniques. Licensed exclusively to us by Fred Hutch, the application has since spawned 31 additional patent applications, from which 12 patents have been granted as of March 31, 2019, including U.S. Patent No. 9,809,813.

Optimizing Nucleic Acid Amplification Reactions

Amplification of nucleic acids can result in over- or under-representation of the amplified molecules, misrepresenting the number present in the source material, such as a blood sample. Dr. Robins invented a method to correct for such bias, thereby improving the precision of PCR-based quantification of TCR and BCR coding sequences in a sample. The claimed approach utilizes synthetic templates, reflecting nucleic acid sequences for rearranged V and J receptor segments in the sampled cells. Twenty-eight related patent applications have since been filed, from which 16 patents have been granted as of March 31, 2019, including U.S. Patent Nos. 9,371,558 and 10,214,770.

Diagnosing and Monitoring Disease

In connection with our Sequenta Acquisition in 2015, we purchased Sequenta's extensive patent portfolio. The portfolio includes 124 patent applications which disclose and claim methods to identify and quantify T cell-based immune responses to antigen exposure using NGS. TCR and BCR DNA, RNA or cell-free DNA from samples, including blood and bone marrow, are used to detect, prognose and monitor disease, including autoimmune disease, infection and cancer. One hundred one patents have been granted in the portfolio as of March 31, 2019, including U.S. Patent Nos. 8,628,927 and 8,236,503.

Our diagnostic methods also apply to the detection of MRD, the target of our clonoSEQ diagnostic test for assessing how disease burden changes in response to treatment or during remission. Nine patents have been granted from additional applications filed by us, including U.S. Patent No. 9,824,179.

TCR-Antigen Map

In connection with our Microsoft collaboration, we are developing a diagnostic product to detect cancer and other diseases at their earliest stage by learning the signals and responses of the activated immune receptors in a patient's blood. Pre-collaboration, we filed 10 related patent applications for methods to produce antigen-exposed enriched T cell populations and identify their antigen specificities by comparison to a pre-exposure population of cells or by use of an algorithm. We expect to file additional patent applications relating to TCRs and algorithmic-based methods to characterize antigen specificities as our work proceeds with Microsoft.

MIRA

We developed and are pursuing patent protection for bioinformatic-based methods to determine the antigen specificity of TCRs by exposing T cells to a panel of multiple antigens. Antigen exposure can be performed by incubation or presentation; for example, it can be performed via recombinant expression in another cell. These methods may also be used to pair the two TCR chains as well as to identify high avidity TCRs. Eight related patent applications have been filed, from which two patents have been granted as of March 31, 2019, including U.S. Patent No. 10,066,265.

pairSEQ

In nature, TCRs and BCRs exist as a heterodimer of paired chains, each of which is encoded on a different chromosome. Immunosequencing reveals the nucleotide structure of each individual chain, but not which chains match as cognate pairs. We developed and are pursuing patent protection for multiple bioinformatic-based approaches to pairing the two chains of TCRs and BCRs, including one deployed in our pairSEQ technique. Our methods also allow for identification of receptor chain pairs which are specific to particular antigen targets. Fifty-four related patent applications have been filed, from which 21 patents have been granted as of March 31, 2019, including U.S. Patent No. 10,077,478.

Assessing Responsiveness to Immunotherapy

Leveraging our immunosequencing technologies, we developed methods for predicting responses to immunotherapy, vaccines and infection. To those ends, rearranged TCR or BCR sequences are quantified and their levels or frequencies compared at different points in time. Twenty-three related patent applications have been filed, from which 15 patents have been granted as of March 31, 2019, including U.S. Patent No. 10,221,461.

In-Licensed and Acquired Intellectual Property Rights

While we have developed the majority of our immune medicine platform, products and services, we occasionally license or acquire third-party owned inventions to bolster the strength of our patent estate and ensure freedom to operate.

Early work by Dr. Robins with Fred Hutch led to discoveries around immunosequencing methods and tools covered by 128 patents and patent applications in the United States and abroad which we exclusively licensed. Our rights are for all fields of use worldwide and are sublicensable. To the extent any licensed granted patent rights extend to products or services sold by us, we pay Fred Hutch a royalty rate of 0.75% of net sales on licensed products.

Through our Sequenta Acquisition, we also obtained an exclusive paid-up license, with rights to sublicense, to patents filed in the United States, Europe, Australia and China owned by iRepertoire, Inc. The license is for worldwide use in diagnosis, prognosis, treatment and monitoring of any proliferative disorder for which rearranged nucleic acids capable of encoding an immune receptor, whether productive or unproductive, or functional or nonfunctional, of a cell, excluding tumor infiltrating lymphocytes, of the proliferative disorder can be used as markers for the disorder, including, but not limited to, lymphoid and myeloid proliferative disorders, such as ALL, CLL, acute myeloid leukemia, chronic myelogenous leukemia, Hodgkin's and Non-Hodgkin's lymphomas, plasma cell neoplasms, such as MM, monoclonal gammopathy of undetermined significance, monoclonal B cell lymphocytosis and myelodysplastic syndromes.

In addition to the patent estate acquired from Sequenta, we also acquired ownership of immunosequencing-related patent portfolios from Imdaptive, Inc. and ImmunID S.A.S.

Trademarks

We own various trademarks, applications and unregistered trademarks in the United States and other commercially important markets, including our company name, product and service names and other trade or service marks. Our trademark portfolio is designed to protect the brands for our products and services, both current and in the pipeline.

Trade Secrecy Program

We have a trade secrecy program to prevent disclosure of our trade secrets to others, except under stringent conditions of confidentiality when disclosure is critical to our business. Our trade secrets include the composition of certain reagents, assay protocols and immunosequencing-related data, such as immune receptor sequences. We protect trade secrets and know-how by establishing confidentiality agreements and invention assignment agreements with our employees, consultants, scientific advisors, contractors and collaborators. These agreements provide that all confidential information developed or made known during the course of an individual or entities' relationship with us must be kept confidential during and after the relationship. These agreements also provide that all inventions resulting from work performed for us or relating to our business and conceived or completed during the period of employment or assignment, as applicable, shall be our exclusive property. In addition, we take other appropriate precautions, such as physical and technological security measures, to guard against misappropriation of our proprietary information by third parties.

Although we take steps to protect our proprietary information and trade secrets, including through contractual means with our employees and consultants, third parties may independently develop substantially equivalent proprietary information and techniques or otherwise gain access to our trade secrets or disclose our technology. Accordingly, we may not be able to meaningfully protect our trade secrets. For more information regarding the risks related to our intellectual property, see "*Risk Factors—Risks Related to Our Intellectual Property*."

Competition

The biotechnology and pharmaceutical industries, including the fields of life sciences research, clinical diagnostics and drug discovery, are characterized by rapidly advancing technologies, intense competition and a strong emphasis on intellectual property. Given the breadth and promise of immune medicine, we face substantial competition from many different sources, including life sciences tools, diagnostics, pharmaceutical and biotechnology companies, academic research institutions and governmental agencies and public and private research institutions across various components of our platform and product and service offerings. Due to the significant interest and growth in immune-driven medicine more broadly, we expect the intensity of the competition to increase. However, we believe our scale, precision and speed, and the resulting clinical applicability, distinguish us from our competitors. In life sciences research, immunoSEQ faces competition from a number of companies, including Thermo Fisher Scientific Inc., ArcherDX, Inc., 10X Genomics, Inc., Invivoscribe, Inc., iRepertoire, Inc., QIAGEN N.V., Takara Bio Inc., Fluidigm Corporation and Dolomite Bio (a brand of Blacktrace Holdings Ltd).

In clinical diagnostics, clonoSEQ faces competition primarily from institutions performing flow cytometry in-house, particularly outside of the United States. Competitors with diagnostic technology platforms include Invivoscribe, Inc., ArcherDX, Inc. and Becton, Dickinson and Company. We may also face competition from companies developing early cancer detection testing products for indications that do not currently compete with clonoSEQ, including GRAIL, Inc. Guardant Health, Inc. Exact Sciences Corporation and Natera, Inc.

In drug discovery, clinical trials in the field of immune-driven medicine are being pursued by a number of industry and academic players. Direct competitors with a pipeline of preclinical and clinical TCR-based cellular therapy candidates include GlaxoSmithKline plc, Adaptimmune Therapeutics plc, Kite Pharma, Inc./Gilead Sciences, Inc., Juno Therapeutics, Inc./Celgene Corporation, bluebird bio, Inc., Immatics Biotechnologies GmbH, Neon Therapeutics, Inc. and several others.

Immune medicine is being pursued by several biotechnology companies as well as by large-cap biopharmaceutical companies. Many of our current or potential competitors, either alone or with their collaboration partners, have significantly greater financial resources and expertise in research and development, manufacturing, regulatory approval and compliance, and sales and distribution than we do. Mergers and acquisitions involving life sciences research, clinical diagnostics or drug discovery companies in the immune medicine space may result in even more resources being concentrated among a smaller number of our competitors. Smaller or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and in acquiring technologies complementary to, or necessary for, our programs.

Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize research or diagnostic products or services that are more accurate, more convenient to use or more cost-effective than our products or services. Competitor therapeutic products could also prove more safe, more effective, more convenient to administer or more cost-effective than any therapeutic products we may develop with our collaborators. Our competitors also may obtain FDA or other regulatory approval for their products more rapidly than we may obtain approval for ours, which could result in our competitors establishing a strong market position before we are able to enter the relevant market.

Government Regulation

Life Sciences Research Use Only Technologies

Our core research product, immunoSEQ, is an RUO tool in the United States that provides data to third parties such as biopharmaceutical companies that are themselves engaged in the research and development of potential diagnostic and therapeutic products and services for which they may later pursue investigation and clearance, authorization or approval from regulatory authorities, such as the FDA.

RUO products belong to a separate regulatory classification under a long-standing FDA regulation. From an FDA perspective, products that are intended for research use only and are labeled as RUO are not regulated by the FDA as *in vitro* diagnostic devices and are therefore not subject to the regulatory requirements discussed below for clinical diagnostic products. Thus, RUO products may be used or distributed for research use without first obtaining FDA clearance, authorization or approval. The products must bear the statement: “For Research Use Only. Not for Use in Diagnostic Procedures.” RUO products cannot make any claims related to safety, effectiveness or diagnostic utility, and they cannot be intended for human clinical diagnostic use. Accordingly, a product labeled RUO but intended or promoted for clinical diagnostic use may be viewed by the FDA as adulterated and misbranded under the FDCA and subject to FDA enforcement action. The FDA will consider the totality of the circumstances surrounding distribution and use of an RUO product, including how the product is marketed and to whom, when determining its intended use. If the FDA disagrees with a company’s RUO status for its product, the company may be subject to FDA enforcement activities, including, without limitation, requiring the company to seek clearance, authorization or approval for the products.

Clinical Diagnostics in the United States

Our first diagnostic product, clonoSEQ, was granted marketing authorization by the FDA for the detection and monitoring of MRD in bone marrow samples in patients with MM and ALL under the *de novo* process, which classified clonoSEQ and future DNA-based tests to measure MRD in hematological malignancies as Class II devices, as explained further below.

In the United States, medical devices are subject to extensive regulation by the FDA under the FDCA and its implementing regulations, and other federal and state statutes and regulations. The FDA regulates the design, development, preclinical, analytical and clinical testing, manufacture, safety, effectiveness, clearance, authorization or approval, record-keeping, packaging, labeling, storage, adverse event reporting, advertising, promotion, marketing, sales, distribution and import and export of medical devices. IVDs are a type of medical device and include reagents and instruments used in the diagnosis or detection of diseases, conditions or infections, including, without limitation, the presence of certain chemicals, genetic information or other biomarkers. Predictive, prognostic and screening tests can also be IVDs.

Devices must undergo premarket review by and receive clearance, authorization or approval from the FDA prior to commercialization, unless the device is of a type exempted from such review by statute, regulation or pursuant to the FDA's exercise of enforcement discretion. For example, the FDA, to date, has generally exercised enforcement discretion over most LDTs, which are tests that are designed, manufactured, validated and used within a single laboratory, subject to certain other limitations such as the LDT not being offered directly to consumers.

Pursuant to the FDCA, medical devices are subject to varying degrees of regulatory control and are classified in one of three classes depending on the controls the FDA determines necessary to reasonably ensure their safety and effectiveness. Class I devices are deemed to be low risk. Class II devices are deemed to be moderate risk. Class III devices are generally the highest risk devices and are subject to the highest level of regulatory control to provide reasonable assurance of the devices' safety and effectiveness.

Class I devices are those for which reasonable assurance of safety and effectiveness can be provided by adherence to the FDA's "general controls" for medical devices. General controls apply to all classes of devices and include FDA's QSR, labeling requirements, premarket review, establishment registration and device listing, the MDR regulation, which requires that manufacturers report to the FDA if their device may have caused or contributed to a death or serious injury or malfunctioned in a way that would likely cause or contribute to a death or serious injury if it were to recur, and the Reports of Corrections and Removals regulation, which requires manufacturers to report recalls and field actions to the FDA if initiated to reduce a risk to health posed by the device or to remedy a violation of the FDCA. Most Class I devices are exempt from premarket regulation; however, some Class I devices require premarket clearance by the FDA through the 510(k) premarket notification process described below.

Class II devices are subject to the FDA's general controls, and any other "special controls," such as performance standards, post-market surveillance and the FDA guidelines, deemed necessary by the FDA to provide reasonable assurance of the devices' safety and effectiveness. Premarket review and clearance by the FDA for Class II devices are accomplished through the 510(k) premarket notification pathway, although some Class II devices are exempt from the 510(k) requirements. Premarket notifications are subject to user fees, unless a specific exemption applies. To obtain 510(k) clearance, a manufacturer must submit a premarket notification demonstrating that the proposed device is "substantially equivalent" to a legally marketed predicate device, which is usually a previously 510(k)-cleared device. In determining substantial equivalence, the FDA assesses whether the

proposed device has the same intended use as the predicate device, and the same technological characteristics as the predicate device, or, if the proposed device has different technological characteristics, that the information submitted in the premarket notification demonstrates the proposed device is as safe and effective as and does not raise different questions of safety and effectiveness than the predicate device. Premarket notifications typically include bench, analytical, and preclinical data, and sometimes include clinical data. The 510(k) pathway usually takes from three to nine months from the time of submission to the FDA, but it can take longer, particularly for a novel type of product. If the FDA determines that a device is substantially equivalent to a predicate device, the subject device may be marketed. However, if the FDA makes a not substantially equivalent determination, then the device would be regulated as a Class III device, discussed below. If a manufacturer obtains a 510(k) clearance for its device and then makes a modification that could significantly affect the device's safety or effectiveness or constitutes a major change or modification in the intended use of the device, a new clearance, authorization or approval may be required.

Class III devices are deemed by the FDA to pose the greatest risk, such as those for which reasonable assurance of the device's safety and effectiveness cannot be assured solely by the general controls and special controls described above and that are life-sustaining or life-supporting. Some pre-amendment Class III devices, for which the FDA has not yet required a PMA, require the FDA's clearance of a premarket notification in order to be marketed. However, most Class III devices are required to undergo the PMA process in which the manufacturer must demonstrate reasonable assurance of the safety and effectiveness of the device for its proposed intended use to the FDA's satisfaction. The PMA pathway is costly, lengthy and uncertain. A PMA application must provide valid scientific evidence, typically extensive preclinical, analytical and clinical trial data and information about the device and its components regarding, among other things, device design, manufacturing and labeling. PMA applications, and supplemental PMA applications, are subject to significantly higher user fees than are 510(k) premarket notifications. Some PMA applications are exempt from a user fee, for example a small business' first PMA. As part of its PMA review process, the FDA will typically inspect the manufacturer's facilities for compliance with QSR requirements, which impose elaborate testing, control, documentation and other quality assurance procedures. The PMA review process typically takes one to three years from submission but can take longer.

Novel devices are placed in Class III by default if the device type was not previously classified by the FDA and has no predicate. Manufacturers of such novel devices may request that the FDA reclassify the device to Class II or Class I via a *de novo* request. The Food and Drug Administration Modernization Act of 1997 established a route to market for low to moderate risk medical devices that are automatically placed into Class III due to the absence of a predicate device, called the "Request for Evaluation of Automatic Class III Designation," or the *de novo* classification procedure. This procedure allows a manufacturer whose novel device is automatically classified into Class III to request down-classification of its medical device into Class I or Class II on the basis that the device presents low or moderate risk, rather than requiring the submission and approval of a PMA. Prior to the enactment of the Food and Drug Administration Safety and Innovation Act ("FDASIA") in July 2012, a medical device could only be eligible for *de novo* classification if the manufacturer first submitted a 510(k) premarket notification and received a determination from the FDA that the device was not substantially equivalent. FDASIA streamlined the *de novo* classification pathway by permitting manufacturers to request *de novo* classification directly without first submitting a 510(k) premarket notification to the FDA and receiving a not substantially equivalent determination. FDASIA sets a review time for the FDA of 120 days following receipt of the *de novo* application, but the FDA does not routinely meet this timeline and has publicly only committed to a review of 150 days for 55% of applications. If the manufacturer seeks reclassification into Class II, the manufacturer must include a draft proposal for special controls that are necessary to provide a reasonable assurance of the safety and effectiveness of the medical device. The FDA may reject the reclassification petition if it identifies a legally marketed predicate device that would be appropriate for a 510(k) or determines that the device is not low to moderate risk or that

general and special controls would be inadequate to ensure the safety and effectiveness of the device. If the FDA agrees with the down-classification, the FDA will grant the device market authorization and establish a classification regulation for the device type. The device can then be used as a predicate device for future 510(k) submissions by the manufacturer or a competitor. In December 2018, the FDA issued proposed regulations to govern the *de novo* classification process, which include requirements beyond what has historically been required in *de novo* submissions. If finalized, these regulations could further impact this path to market.

A clinical trial may be required in support of a 510(k) or *de novo* submission and generally is required for a PMA application. These trials require an Investigational Device Exemption ("IDE") approved by the FDA for a specified number of patients and sites, unless the product is exempt from IDE requirements or deemed a non-significant risk device eligible for more abbreviated IDE requirements. Most clinical studies of IVDs are exempt from the IDE requirements, if certain requirements are met. The IDE application must be supported by appropriate data, such as animal and laboratory testing results, showing that it is safe to test the device in or on humans and that the testing protocol is scientifically sound. Clinical trials may begin 30 days after the submission of the IDE application unless the FDA disapproves the IDE or places the trial on clinical hold. Additionally, clinical trials may not begin until their protocol and informed consent receive approval from the appropriate ethical review boards, including IRBs. Unless an exemption applies, clinical trials intended to assess the safety or efficacy of a device must be conducted in accordance with the FDA's IDE requirements. Clinical investigations that are not assessing safety and effectiveness but are being used to generate other data to support FDA submissions are subject to the more broadly applicable informed consent and IRB regulations.

Even if regulatory clearance, authorization or approval of a device is granted, the FDA may impose limitations on the uses and indications for which the device may be labeled and promoted, and the device remains subject to significant regulatory requirements. Medical devices may be marketed only for the uses and indications for which they are cleared, authorized or approved.

After a device, including a device exempt from FDA premarket review, is placed on the market, numerous post-market regulatory requirements apply. These requirements as discussed above in the general controls. Some manufacturers also may be subject to post-market surveillance regulations. Facility records and manufacturing processes are subject to periodic unscheduled inspections by the FDA.

Failure to comply with applicable regulatory requirements can result in enforcement action by the FDA, which may include, among other things: untitled letters, public warning letters, fines, injunctions, civil or criminal penalties, recall or seizure of products, operating restrictions, partial suspension or total shutdown of production, delays in or refusals of 510(k), *de novo* or PMA submissions, withdrawing existing clearance, authorization and approval, and a recommendation by the FDA to disallow a device manufacturer from entering into government contracts. If certain conditions are met, the FDA also has the authority to order manufacturers to repair, replace or refund the cost of any devices that present an unreasonable risk of substantial harm to the public health. In the event that a supplier fails to maintain compliance with FDA or the device manufacturer's quality requirements, the manufacturer may have to qualify a new supplier and could experience manufacturing delays as a result.

Position in the European Union

In the EU, IVDs can be placed on the market by obtaining a "CE mark," which demonstrates conformity with the *In vitro* Diagnostic Medical Device Directive ("IVDD"). The requirements under the Directive include:

- *Essential Requirements*. The IVDD specifies "essential requirements" that all medical devices must meet to demonstrate the product is safe and effective under normal conditions of use.

The requirements are similar to those adopted by the FDA relating to quality systems and product labeling.

- *Conformity Assessment*. The requirements to obtain a CE mark are risk-based, and follow a similar classification system as in the United States. However, unlike the United States, which requires virtually all devices to undergo some level of premarket review by the FDA, the IVDD currently allows manufacturers to bring many devices to market using a process in which the manufacturer self-certifies that the device conforms to the applicable essential requirements.
- *Vigilance*. The IVDD specifies requirements for post market reporting similar to those adopted by the FDA.

On May 26, 2017, the EU released a new regulatory framework, the *In vitro* Diagnostic Medical Device Regulation ("IVDR"), which will replace the IVDD. Our products in the EU will have to comply with the IVDR requirements after May 26, 2022, subject to the applicable transitional provisions before full compliance is required. The IVDR is considerably stricter in regulatory oversight than the IVDD and will require more IVD devices to be reviewed by the relevant body before being placed on the market. Until that time, our products must continue to meet the requirements of IVDD for commercialization in the EU.

Laboratory Developed Tests in the United States

clonoSEQ is available as an LDT for use in assessing MRD for other lymphoid malignancies, including CLL and NHL, at our Seattle, Washington laboratory. LDTs have generally been considered to be tests that are designed, developed, validated and used within a single laboratory. The FDA takes the position that it has the authority to regulate such tests as medical devices under the FDCA, but the FDA has historically exercised enforcement discretion and has not required clearance, authorization or approval of LDTs prior to marketing. Laboratories certified as "high complexity" under CLIA may develop, manufacture, validate and run LDTs. The CLIA requirements are discussed below in "—*United States Federal and State Regulation of Laboratories*."

Although we believe we are within the scope of the FDA's policy on enforcement discretion for LDTs, the initial commercialization and continued commercial availability of an LDT is subject to uncertainty given the FDA's latitude in interpreting and applying its laws and policies. For example, the FDA does not consider tests to be subject to its LDT enforcement discretion if they were or are designed or manufactured completely, or partly, outside of the laboratory that offers and uses them, or if they are offered "over-the-counter," as opposed to being available to patients only when prescribed by a healthcare provider. Even for tests that appear to fall within the FDA's previously stated enforcement discretion, the FDA may decide to take action against certain LDTs on a case-by-case basis at any time if the FDA views them as presenting a risk to patients. The FDA Commissioner and the Director of the CDRH have expressed significant concerns regarding potential disparities in accuracy and quality between some LDTs and IVDs that have been reviewed and cleared, authorized or approved by the FDA. In addition, the U.S. Congress has been considering various legislative proposals that would reform the FDA's regulation of laboratory tests, and such legislation might lead to heightened FDA scrutiny of LDTs, particularly new LDTs, in the future. Whether such legislation will pass and, if so, what effect it may have on how the FDA regulates laboratory tests, including LDTs, is unknown. If the FDA disagrees with a laboratory test's LDT status, the FDA may consider the test to be an unapproved medical device, may subject us to FDA enforcement action, including, without limitation, requiring us to seek clearance, authorization or approval for the laboratory test.

On October 3, 2014, the FDA issued two draft guidance documents proposing a new regulatory paradigm for oversight of LDTs. These draft guidance documents proposed more active review of LDTs. The draft guidance documents were the subject of considerable controversy, and in November

2016, the FDA announced that it would not be finalizing the 2014 draft guidance documents. On January 13, 2017, the FDA issued a discussion paper which laid out elements of a possible revised future LDT regulatory framework, but did not establish any regulatory requirements.

The FDA's recent efforts to regulate LDTs have prompted the drafting of legislation governing diagnostic products and services that seeks to substantially revamp the regulation of both LDTs and IVDs. The U.S. Congress may act to provide further direction to the FDA on the regulation of LDTs and substantially modify the regulation of IVDs, which might result in heightened FDA scrutiny of LDTs, particularly new LDTs, in the future.

U.S. Federal and State Regulation of Laboratories

Given that aspects of our business at certain facilities involve acting as a clinical laboratory, we are required to hold certain federal and state licenses, certifications and permits to conduct our business.

As to federal certifications, CLIA establishes rigorous quality standards for all laboratories that perform testing on specimens derived from humans for the purpose of providing information for the diagnosis, prevention or treatment of disease, or the impairment of, or assessment of health. As a clinical laboratory, we must obtain a CLIA certificate based on the complexity of testing performed at the laboratory, such as a Certificate of Compliance for high-complexity testing. CLIA also mandates compliance with various operational, personnel, facilities administration, quality and proficiency requirements, intended to ensure that their clinical laboratory testing services are accurate, reliable and timely. CLIA compliance and certification is also a prerequisite to be eligible to bill for services provided to government payors and for many private payors. Furthermore, we are subject to survey and inspection every two years to assess compliance with program standards, and may be subject to additional unannounced inspections. Laboratories performing high-complexity testing are required to meet more stringent requirements than laboratories performing less complex tests.

In addition to CLIA requirements, we elect to participate in the accreditation program of the CAP. CMS, the agency that oversees CLIA, has deemed CAP standards to be equally or more stringent than CLIA regulations and has approved CAP as a recognized accrediting organization. Inspection by CAP is performed in lieu of CMS inspections for accredited laboratories. Therefore, because we are accredited by the CAP Laboratory Accreditation Program, we are deemed to also comply with CLIA.

CLIA provides that a state may adopt laboratory regulations that are more stringent than those under federal law, and a number of states have implemented their own more stringent laboratory regulatory requirements. Select states, including Washington, have laboratory regulations that have been deemed by the federal government to be at least as stringent as CLIA, and thus laboratories licensed under those state regimes are exempt from CLIA and the state Department of Health is permitted to issue a CLIA number, along with a state Medical Test Site license, rather than a certificate being issued by CMS. Our laboratory holds the required Washington license. State laws may require that laboratory personnel meet certain qualifications, specify certain quality control procedures, facility requirements or prescribe record maintenance requirements.

Several states additionally require the licensure of out-of-state laboratories that accept specimens from those states. For example, New York requires a laboratory to hold a permit which is issued after an on-site inspection and approval of each LDT offered by a laboratory, and has various, more stringent requirements than CLIA and CAP, including those for personnel qualifications, proficiency testing, physical facility and equipment and quality control standards. Our laboratory holds the required licenses for Maryland, Rhode Island, Pennsylvania and California. We are currently in the process of seeking a permit in the State of New York, and currently operate under the New York non-permitted laboratory test request program.

From time to time, other states may require out-of-state laboratories to obtain licensure in order to accept specimens from the state. If we identify any other state with such requirements, or if we are contacted by any other state advising us of such requirements, we intend to follow instructions from the state regulators as to how we should comply with such requirements.

If a clinical laboratory is found to be out of compliance with CLIA certification, CAP accreditation or a state license or permit, the applicable regulatory agency may, among other things, suspend, restrict or revoke the certification, accreditation, license or permit to operate the clinical laboratory, assess civil monetary penalties and impose specific corrective action plans, among other sanctions.

Federal and State Privacy, Security and Breach Notification Laws

Many state and federal laws govern the processing of personally identifiable information or individually identifiable health information. At the federal level, under the administrative simplification provisions of HIPAA and HITECH, the HHS issued regulations that establish standards for protecting the privacy and security of "protected health information" used or disclosed by certain healthcare providers and other "covered entities" and their "business associates." Three principal data protection-related regulations with which we are required to comply have been issued in final form under HIPAA and HITECH: privacy regulations, security regulations and security breach notification regulations.

The privacy regulations govern the use and disclosure of "protected" health information by covered healthcare providers, as well as health insurance plans. They also set forth certain rights that an individual has with respect to his or her protected health information maintained by a covered health care provider, including the right to access or amend certain records containing protected health information or to request restrictions on the use or disclosure of protected health information. The security regulations establish requirements for safeguarding the confidentiality, integrity and availability of protected health information that is electronically transmitted or electronically stored. HITECH, among other things, established certain health information security breach notification requirements. A covered entity must notify HHS and each affected individual of a breach of unsecured protected health information as well as the media if the breach involves more than 500 individuals.

HIPAA violations are subject to civil and criminal penalties. Additionally, to the extent that we submit electronic healthcare claims and payment transactions that do not comply with the electronic data transmission standards established under HIPAA and HITECH, payments to us may be delayed or denied. Although there is no private right of action, HIPAA has been used as the standard of care in negligence actions brought under state law.

Section 5(a) of the FTCA has also been used to regulate data privacy and security at the federal level. According to the FTC, failing to take appropriate steps to keep consumers' personal information secure or using or disclosing personal information in violation of a company's privacy notice may constitute unfair or deceptive acts or practices in or affecting commerce in violation of the FTCA. The FTC expects a company's data security measures to be reasonable and appropriate in light of the sensitivity and volume of consumer information it holds, the size and complexity of its business and the cost of available tools to improve security and reduce vulnerabilities.

In addition, certain state laws govern the privacy and security of health information, some of which are more stringent than HIPAA and many of which differ from each other in significant ways and may not have the same effect, thus complicating compliance efforts. In addition, there are state breach notification laws in every state. The HIPAA regulations establish a federal "floor" of protection and do not supersede state laws that may be more stringent or provide individuals with greater rights with respect to the privacy or security of, and access to their records containing health information. Failure to comply with these laws, where applicable, can result in the imposition of significant civil or criminal

penalties and private litigation. For example, California recently enacted legislation, the CCPA, which goes into effect January 1, 2020 and will be enforceable as of July 1, 2020. The CCPA, among other things, creates new data privacy obligations for covered companies and provides new privacy rights to California residents, including the right to opt out of certain disclosures of their information. The CCPA also creates a private right of action with statutory damages for certain data breaches, thereby potentially increasing risks associated with a data breach.

General Data Protection Regulation in the EU

The GDPR is a legal framework that sets requirements for the collection and processing of personal information of individuals within the EEA. The GDPR sets out the principles for data management and the rights of the individual, while also imposing very significant fines that can be revenue-based. It applies to U.S. companies that process personal information of persons in the EEA in connection with the offer of products or services to those persons, or the monitoring of such persons' behavior. It may also apply when a U.S. company processes personal information in the context of the activities of an entity established in the EEA. The GDPR became enforceable on May 25, 2018. The regulation applies to the human resources record of employees and even the Intellectual Property addresses of people using online services. The GDPR builds upon data rights that the EU had previously advocated, such as the right of an individual to be forgotten and the right to data portability.

Federal, State and Foreign Fraud and Abuse Laws

In the United States, there are various fraud and abuse laws with which we must comply and we are subject to regulation by various federal, state and local authorities, including CMS, other divisions of HHS, such as the OIG, the DOJ and individual U.S. Attorney offices within the DOJ, and state and local governments. We also may be subject to foreign fraud and abuse laws.

In the United States, the AKS prohibits, among other things, knowingly and willfully offering, paying, soliciting or receiving remuneration to induce or in return for patient referrals for, or purchasing, leasing, ordering or arranging for the purchase, lease or order of, any healthcare item or service reimbursable under a governmental payor program. Courts have stated that a financial arrangement may violate the AKS if any one purpose of the arrangement is to encourage patient referrals or other federal healthcare program business, regardless of whether there are other legitimate purposes for the arrangement. The definition of "remuneration" has been broadly interpreted to include anything of value, including gifts, discounts, meals, travel, credit arrangements, payments of cash, consulting fees, waivers of co-payments, ownership interests and providing anything at less than its fair market value. Recognizing that the AKS is broad and may technically prohibit many innocuous or beneficial arrangements within the healthcare industry, the OIG issued a series of regulatory "safe harbors." These safe harbor regulations set forth certain provisions, which, if met, will assure healthcare providers and other parties that they will not be prosecuted under the AKS. The failure of a transaction or arrangement to fit within a specific safe harbor does not necessarily mean that the transaction or arrangement is illegal or that prosecution under the AKS will be pursued. In those instances, arrangements will be evaluated on a case-by-case basis to determine whether enforcement will be pursued. Penalties for AKS violations are severe and can include imprisonment, criminal fines, civil monetary penalties and exclusion from participation in federal healthcare programs. The regulations establishing safe harbor protection are subject to change and could affect future operations. Many states also have anti-kickback statutes, some of which may apply to items or services reimbursed by any third-party payor, including commercial insurers as well as patient self-pay. A violation of the AKS may be grounds for the government or a whistleblower to assert that a claim for payment of items or services resulting from such violation constitutes a false or fraudulent claim for purposes of the federal civil False Claims Act.

The civil monetary penalties statute is another potential statute under which a clinical laboratory may be subject to enforcement. Among other things, the civil monetary penalties statute imposes fines against any person who is determined to have presented, or caused to be presented, claims to a federal healthcare program that the person knows, or should know, is for an item or service that was not provided as claimed or is false or fraudulent. The civil monetary penalties statute also prohibits a person from offering or providing remuneration to any Medicare or Medicaid beneficiary that is likely to influence the individual to order or receive its items or services from a particular provider or supplier.

The exclusion statute requires the exclusion of entities and individuals who have been convicted of federal-program related crimes or healthcare felony fraud or controlled substance charges. The statute also permits the exclusion of those that have been convicted of any form of fraud, the AKS, for obstructing an investigation or audit, certain controlled substance offenses, those whose healthcare license has been revoked or suspended and those who have filed claims for excessive charges or unnecessary services. If we were to be excluded, our products and services would be ineligible for reimbursement from any federal programs, including Medicare and Medicaid, and no other entity participating in those programs would be permitted to enter into contracts with us. In order to preserve access to beneficial healthcare items and services, the government may elect to exclude officers and key employees of manufacturers, rather than excluding the organization. Such enforcement actions would prohibit us from engaging those individuals, which could adversely affect operations and result in significant reputational harm.

Congress has also enacted statutes that impose criminal liability for healthcare fraud and abuse. The Health Care Fraud Statute prohibits knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program, including private payors. A violation of this statute is a felony and may result in fines, imprisonment or exclusion from governmental payor programs such as the Medicare and Medicaid programs. The false statements statute prohibits knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false, fictitious or fraudulent statement in connection with the delivery of or payment for healthcare benefit programs, items or services-public or private. A violation of this statute is a felony and may result in fines, imprisonment or exclusion from governmental payor programs.

The False Claims Act imposes liability on any person or entity that, among other things, knowingly presents, or causes to be presented, a false or fraudulent claim for payment by a federal governmental payor program. The *qui tam* provisions of the False Claims Act allow a private individual to bring actions on behalf of the federal government alleging that the defendant has defrauded the federal government by submitting a false claim to the federal government and permit such individuals to share in any amounts paid by the entity to the government in fines or settlement. *Qui tam* complaints are filed under seal, and the cases may progress for a number of years before a complaint is unsealed and a healthcare provider or supplier becomes aware of its existence. When an entity is determined to have violated the False Claims Act, it may be required to pay up to three times the actual damages sustained by the government, plus civil penalties ranging from $11,181 to $22,363 for each false claim. The False Claims Act is the federal government's primary civil tool in healthcare fraud cases. False Claims Act liability is not limited to direct providers of health items or services. The government has asserted liability under the False Claims Act against manufacturers and other third parties who caused another party to file a false claim.

In addition, various states have enacted false claim laws analogous to the federal False Claims Act, although many of these state laws apply where a claim is submitted to any third-party payor and not merely a governmental payor program.

On October 25, 2018, the SUPPORT Act was enacted. The SUPPORT Act included EKRA, which establishes an all-payor anti-kickback prohibition that extends to arrangements with recovery

homes, clinical laboratories and clinical treatment facilities. EKRA includes a number of statutory exceptions, and directs agencies to develop further exceptions. Current exceptions in some cases reference and in others differ from the AKS safe harbors. Significantly, the prohibitions apply with respect to the soliciting or receipt of remuneration for any referrals to recovery homes, clinical treatment facilities, or clinical laboratories, whether or not related to treating substance use disorders. Further, the prohibitions cover the payment or offer of remuneration to induce a referral to, or in exchange for, an individual using the services of, such providers. This new law creates additional risk that relationships with referral sources could be problematic.

For anti-corruption legislation, the FCPA is the most widely enforced law. It is the first to introduce corporate liability, responsibility for third parties and extraterritoriality for corruption offences, meaning companies and persons can be held criminally and civilly responsible for corruption offences committed abroad. It was enacted for the purpose of making it unlawful for certain classes of persons and entities to make payments to foreign government officials to assist in obtaining or retaining business. With the enactment of certain amendments in 1998, the anti-bribery provisions of the FCPA now also apply to foreign firms and persons who cause, directly or through agents, an act in furtherance of such a corrupt payment to take place within the territory of the United States. The FCPA also requires companies whose securities are listed in the United States to meet its accounting provisions, which were designed to operate in tandem with the anti-bribery provisions, require corporations covered by the provisions to (a) make and keep books and records that accurately and fairly reflect the transactions of the corporation and (b) devise and maintain an adequate system of internal accounting controls.

In Europe, various countries have adopted anti-bribery laws providing for severe consequences, in the form of criminal penalties or significant fines, for individuals or companies committing a bribery offence. Violations of these anti-bribery laws, or allegations of such violations, could have a negative impact on our business, results of operations and reputation. For instance, in the United Kingdom, under the Bribery Act 2010, which came into effect in July 2011, a bribery offense occurs when a person offers, gives or promises to give a financial or other advantage to induce or reward another individual to improperly perform certain functions or activities, including any function of a public nature. Bribery of foreign public officials also falls within the scope of the Bribery Act 2010. Under this regime, an individual found in breach of the Bribery Act 2010 faces imprisonment of up to 10 years. In addition, the individual can be subject to an unlimited fine, if found to have committed an offense, as can commercial organizations that are found to have failed to prevent bribery. Most recently, France has passed an anti-bribery and compliance law (“Sapin II”), and the new French anti-corruption agency (“AFA”) has been established. The Sapin II law makes it compulsory for companies within the scope of the law to implement internal procedures to fight corruption. One of the items that must be prepared is a corruption risk map, as well as an anti-corruption code of conduct. These documents are subject to investigation by the AFA and failure to comply with the requirements can lead to a fine of up to €1.0 million for a company and €200,000 for executives.

Currently, we are not subject to the jurisdictional requirements of the UK Bribery Act or Sapin II as we do not have offices in either country and do not employ a requisite amount of employees in these countries. If we were to have future growth in the European market, these laws could potentially apply to us.

U.S. Physician Referral Prohibitions

The Stark Law prohibits physicians from referring patients to entities with which the physician or an immediate family member has a financial relationship, such as ownership, investment or compensation, for DHS payable by Medicare and Medicaid, unless the financial arrangement meets an applicable exception. DHS includes clinical laboratory tests. See “*Risk Factors—Risks Relating to*

Government Regulation—We are subject to various laws and regulations, such as healthcare fraud and abuse laws, false claim laws and health information privacy and security laws, among others, and failure to comply with these laws and regulations may have an adverse effect on our business."

Corporate Practice of Medicine in the United States

Numerous states have enacted laws prohibiting business corporations, such as us, from practicing medicine and employing or engaging physicians to practice medicine, generally referred to as the prohibition against the corporate practice of medicine. These laws are designed to prevent interference in the medical decision-making process by anyone who is not a licensed physician. For example, California's Medical Board has indicated that determining what diagnostic tests are appropriate for a particular condition and taking responsibility for the ultimate overall care of the patient, including providing treatment options available to the patient, would constitute the unlicensed practice of medicine if performed by an unlicensed person. Violation of these corporate practice of medicine laws may result in civil or criminal fines, as well as sanctions imposed against us or the professional through licensure proceedings. Typically such laws are only applicable to entities that have a physical presence in the state.

Other Regulatory Requirements

Our laboratory is subject to federal, state and local regulations relating to the handling and disposal of regulated medical waste, hazardous waste and biohazardous waste, including chemical, biological agents and compounds, blood and bone marrow samples and other human tissue. Typically, we use outside vendors who are contractually obligated to comply with applicable laws and regulations to dispose of such waste. These vendors are licensed or otherwise qualified to handle and dispose of such waste.

Our partners in the development of therapeutic agents are responsible for developing and manufacturing those products. In so doing, they are subject to FDA and Medicare regulatory requirements related to, among other things, manufacture, promotion, price reporting and fraud and abuse laws.

Our laboratories are subject to extensive requirements related to workplace safety established by the U.S. Occupational Safety and Health Administration. These include requirements to develop and implement programs to protect workers from exposure to blood-borne pathogens by preventing or minimizing any exposure through needle stick or similar penetrating injuries.

U.S. Healthcare Reform

In the United States, a number of recent legislative and regulatory changes at the federal and state levels have sought to reduce healthcare costs and improve the quality of healthcare. For example, in March 2010, the ACA became law. This law substantially changed the way healthcare is financed by both commercial and government payors, and it has significantly impacted our industry. Since 2016 there have been efforts to repeal all or part of the ACA. For example, the TCJA, among other things, removes penalties for not complying with the ACA's individual mandate to carry health insurance. The U.S. Congress may take further action regarding the ACA, including, but not limited to, repeal or replacement. Additionally, all or a portion of the ACA and related subsequent legislation may be modified, repealed or otherwise invalidated through judicial challenge, which could result in lower numbers of insured individuals, or reduced coverage for insured individuals, and which could adversely affect our business. However, it remains to be seen whether or when new legislation modifying the ACA will be enacted, what any such the new legislation might provide and what impact it might have on the size and coverage of the insured population or on efforts to contain or lower the cost of healthcare.

We cannot predict the implications, if any, of such legislation on our and our collaborators' businesses and financial conditions.

We anticipate there will continue to be proposals by legislators at both the federal and state levels, regulators and commercial payors to reduce costs while trying to expand individual healthcare benefits. If enacted, some such proposals could expand or contract the insured population, increasing or decreasing demand for our products and services. On the other hand, some proposals could impose additional limitations on the prices we will be able to charge for our tests or on the coverage of or the amounts of reimbursement available for our tests from payors, including commercial payors and government payors.

The Physician Payments Sunshine Act and its implementing regulations, which requires applicable manufacturers of covered drugs, devices, biologics and medical supplies for which payment is available under Medicare, Medicaid or the State Children's Health Insurance Program, with certain exceptions, to annually report to HHS information related to certain payments or other transfers of value made or distributed to physicians, defined to include doctors, dentists, optometrists, podiatrists and chiropractors, and teaching hospitals, or to entities or individuals at the request of, or designated on behalf of, the physicians and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members. The SUPPORT Act, under a provision entitled "Fighting the Opioid Epidemic with Sunshine," extends the Physician Payments Sunshine Act to payments and transfers of value to physician assistants, nurse practitioners and other mid-level healthcare providers, with reporting requirements going into effect in 2022 for payments and transfers of value made to these practitioners in 2021.

Coverage and Reimbursement Generally

Patients who have diagnostic tests ordered or are prescribed treatments and providers performing the prescribed services generally rely on third-party payors to reimburse all or part of the associated healthcare costs. Sales of our products and services will therefore depend substantially, both domestically and abroad, on the extent to which the costs of our products and services will be paid by third-party payors, including health maintenance, managed care and similar healthcare management organizations, or reimbursed by government health administration authorities, such as Medicare and Medicaid, private health insurers.

In the United States, our ability to commercialize and the commercial success of our product and service offerings will depend in part on the extent to which governmental payor programs at the federal and state levels, including Medicare and Medicaid, private health insurers and other third-party payors provide coverage for and establish adequate reimbursement levels for these offerings. Government authorities, private health insurers and other organizations generally decide which devices they will pay for and establish reimbursement levels for healthcare. Medicare is a federally funded program for the elderly and disabled managed by CMS, through local contractors that administer coverage and reimbursement for certain healthcare items and services. Medicaid is an insurance program for certain categories of patients whose income and assets fall below state defined levels that is funded jointly by federal and state governments and managed by each state. Similarly, the federal government manages other healthcare programs, including the Veterans Health Administration, the Indian Health Service, and Tricare, the healthcare program for military personnel, retirees and related beneficiaries. Many states have also created pharmacy assistance programs for individuals who do not qualify for federal programs. In the United States, private health insurers and other third-party payors often provide reimbursement for products and services based in part on the coverage and payment rates set by the Medicare or Medicaid programs.

Certain countries, including a number of member states of the EU, set prices and make reimbursement decisions for diagnostics and pharmaceutical products, or medicinal products, as they

are commonly referred to in the EU. In addition, an increasing number of countries are taking initiatives to attempt to control the healthcare budget by focusing cost-cutting efforts on medicinal products, and to a lesser extent, medical devices, provided under their state-run healthcare systems. These international price-control efforts have impacted all regions of the world, but have been most drastic in the EU. Additionally, some countries require approval of the maximum sale price of a product before it can be marketed, and this price may be reviewed during the product lifecycle, or mandatory discounts or profit caps may be applied. In many countries, the pricing review period begins after marketing or product licensing approval is granted or the CE mark is obtained.

Federal programs in the United States also sometimes impose price controls through mandatory ceiling prices on purchases by federal agencies and federally funded hospitals and clinics and mandatory rebates on retail pharmacy prescriptions paid by Medicaid and Tricare. These restrictions and limitations influence the purchase of healthcare services and products. Legislative proposals to reform healthcare or reduce costs under government programs may result in lower reimbursement for our products and services or exclusion of our products and services from coverage. In addition, government programs like Medicaid include what are in effect substantial penalties for increasing commercial prices of certain products over the rate of inflation which can affect realization and return on investment.

Increasing efforts by governmental and third-party payors, in the United States and abroad, to cap or reduce healthcare costs may cause such organizations to limit both coverage and level of reimbursement for newly approved healthcare products. At the state level, legislatures are increasingly passing legislation and implementing regulations designed to control pharmaceutical and biological program pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing.

As a result of the above trends, we may need to conduct expensive studies in order to demonstrate the medical necessity and cost effectiveness of our products and services, in addition to the costs required to obtain the FDA and other comparable foreign regulatory authority approvals. Our products and services may not be considered medically necessary or cost effective, or the discount percentages required to secure coverage may not yield an adequate margin over cost.

There is often pressure to renegotiate pricing and reimbursement levels, including, in particular, in connection with changes to Medicare coverage and reimbursement. Third-party payors continue to demand discounted fee structures, and the trend toward consolidation among third-party payors tends to increase their bargaining power over price structures. If third-party payors reduce their rates for our products and services, then our revenue and profitability may decline and our operating margins will be reduced. Because some third-party payors rely on all or portions of Medicare payment systems to determine payment rates, changes to government healthcare programs that reduce payments under these programs may negatively impact payments from third-party payors. Our inability to maintain suitable financial arrangements with third-party payors could have a material adverse impact on our business. Additionally, the reimbursement process is complex and can involve lengthy delays. Third-party payors may disallow, in whole or in part, providers' requests for reimbursement based on determinations that certain amounts are not reimbursable under plan coverage, that the services provided were not medically necessary or that additional supporting documentation is necessary. Retroactive adjustments may change amounts realized from third-party payors. Delays and uncertainties in the reimbursement process may adversely affect market acceptance and utilization of our candidate products, resulting in reduced revenue. The unavailability or inadequacy of third-party coverage and reimbursement could negatively affect the market acceptance of our products and services and the future revenue we may expect to receive from those products and services. In addition, we are unable to predict what additional legislation or regulation relating to the healthcare

industry or third-party coverage and reimbursement may be enacted in the future, or what effect such legislation or regulation would have on our business.

Many hospitals implement a controlled and defined process for covering and approving diagnostic tests and medical devices. Any marketing efforts that are determined to have violated such policies could result in the denial or removal of our products from that hospital's list of approved products.

Moreover, a payor's decision to provide coverage for a device does not imply that an adequate reimbursement rate will be approved. Adequate third-party reimbursement may not be available to enable us to maintain price levels sufficient to realize an appropriate return on our investment in device development. Legislative proposals to reform healthcare or reduce costs under government insurance programs may result in lower reimbursement for our products and services or exclusion of our products and services from coverage. The cost containment measures that healthcare payors and providers are instituting and any healthcare reform could significantly reduce our revenue from the sale of any approved products and services. We cannot provide any assurances that we will be able to obtain and maintain third-party coverage or adequate reimbursement for our products and services in whole or in part.

For additional information on coverage and reimbursement, see "*Risk Factors—Risks Relating to Government Regulation—Future Medicare payment rates are uncertain*."

Our Compliance Program

Our compliance program is intended to prevent and detect violations of law or our policies. It was developed in view of both adopting the principles of the AdvaMed Code of Ethics and addressing the HHS OIG's elements of a compliance program. We have designed our compliance program to fit the size, resources, market position and other unique aspects of our company. Our code of conduct is our statement of ethical and compliance principles that guide our daily operations. In addition, we have developed policies and procedures, and corresponding education and training, to effectively communicate our standards to employees as it relates to job functions and legal obligations under applicable state and federal healthcare program requirements, as well as those outside the United States. We regularly perform live and process monitoring activities on a risk-based approach, and audit capabilities are built into our transparency procedures. We maintain a hotline available via multiple channels to report any known or suspected compliance violations, and we have a strict non-retaliation policy for all claims brought forward in good faith.

Facilities

Our corporate headquarters are located in Seattle, Washington, where we currently lease approximately 58,380 square feet of laboratory and office space. Our Seattle lease expires in June 2023, subject to two options to extend the lease for seven years. We also lease approximately 13,431 square feet of laboratory and office space in South San Francisco, California, pursuant to lease expiring in March 2026. We intend to add new facilities or expand existing facilities as we add employees and scale our operations, and we believe suitable additional or substitute space will be available as needed.

Legal Proceedings

From time to time, we may be subject to legal proceedings. We are not currently a party to or aware of any proceedings that we believe will have, individually or in the aggregate, a material adverse effect on our business, financial condition or results of operations. Regardless of outcome, litigation can have an adverse impact on us because of defense and settlement costs, diversion of management resources and other factors.

MANAGEMENT

Executive Officers

The following table sets forth certain information, as of March 31, 2019, concerning our executive officers who, subject to rights pursuant to any employment agreements, serve at the pleasure of our board of directors:

Name	Age	Position
Chad Robins	44	Chief Executive Officer, Co-Founder, Director and Chairman
Julie Rubinstein	47	President
Harlan Robins, PhD.	45	Chief Scientific Officer and Co-Founder
Chad Cohen	44	Chief Financial Officer
Sean Nolan	50	Chief Technical Officer
Lance Baldo, MD	46	Chief Medical Officer
Francis Lo	38	Chief People Officer
Charles Sang	51	Senior Vice President, Clinical Diagnostics
Sharon Benzeno, PhD.	45	Senior Vice President, Drug Discovery
Nancy Hill	55	Senior Vice President, Operations

The following is a biographical summary of the experience of our executive officers.

Chad Robins co-founded our company in September 2009 and has served as our Chief Executive Officer and a member of our board of directors since incorporation. Prior to co-founding our company, Mr. Robins held numerous executive-level positions in medical technology, investment and real estate companies. Mr. Robins holds an MBA from The Wharton School at the University of Pennsylvania and a BS in Managerial Economics from Cornell University. We believe Mr. Robins is qualified to serve as a member of our board of directors based on our review of his experience, qualifications, attributes and skills, including co-founding our company and his executive leadership experience in the biotechnology industry.

Julie Rubinstein has served as our President since February 2018. Prior to becoming our President, Ms. Rubinstein served as our Chief Business Officer from January 2016 to February 2018, and our head of Corporate and Business Development from April 2011 to January 2016. Prior to joining us, Ms. Rubinstein held various worldwide commercial development roles at Pfizer Inc.'s Oncology division, primarily focusing on cancer immunotherapy. She also served in various roles with Johnson & Johnson Services, Inc., including in Europe. Ms. Rubinstein currently serves on the Board of Trustees for The Valerie Fund, a pediatric oncology organization in New Jersey and New York. Ms. Rubinstein holds an MBA from Harvard Business School and dual undergraduate degrees from The Wharton School and Annenberg School of Communications at the University of Pennsylvania.

Harlan Robins, PhD, co-founded our company in September 2009 and has served as either our Chief Scientific Officer or our Head of Innovation since incorporation. Dr. Robins has served in various roles in the Computational Biology Program at Fred Hutch, including as an Assistant Faculty Member from 2006 to 2011, as an Associate from 2011 to April 2016 and as a Full Member and the Head of the program from April 2016 to June 2019. Dr. Robins holds a BS in Physics from Harvard University and a master's degree and PhD in Physics from the University of California, Berkeley with a visiting appointment to the California Institute of Technology. Dr. Robins received postdoctoral appointments in the particle theory group at the Weizmann Institute of Science in Israel and at the Institute for Advance Study at Princeton University. At Princeton, Dr. Robins developed bioinformatics algorithms for micro RNA targets and bacterial genome analysis.

Chad Cohen has served as our Chief Financial Officer since August 2015. Prior to joining us, Mr. Cohen served as the Chief Financial Officer of Zillow Group, Inc., a public company that operates a

real estate marketplace, from March 2011 to August 2015, where he also served as Corporate Controller from June 2006 to March 2011 and Vice President of Finance from September 2010 to March 2011. Prior to joining Zillow, Mr. Cohen served as Assistant Controller and Financial Integrity Manager at Ticketmaster Entertainment, Inc. from 2003 to 2006. Prior to becoming our Chief Financial Officer, Mr. Cohen served on our board of directors from February 2015 to August 2015. Mr. Cohen currently serves on the board of directors of Trupanion, Inc., a public pet insurance company, including as chair of the audit committee. Mr. Cohen holds a BS in Business Administration from Boston University.

Sean Nolan has served as our Chief Technical Officer since July 2014. Prior to joining us, Mr. Nolan served as the General Manager and Distinguished Engineer of Microsoft's HealthVault and Health Solutions Group from January 2006 to May 2014, ran his own consulting firm from January 2002 to January 2006, and served as Chief Technology Officer and Software Development Manager at Drugstore.com from 2000 to January 2002 and August 1998 to 2000, respectively. Mr. Nolan holds a BA in Computer Science from Dartmouth College.

Lance Baldo, MD, has served as our Chief Medical Officer since April 2019. From March 2010 to April 2019, Dr. Baldo served in various roles of ascending responsibility with the Roche Group, a global healthcare company, and its affiliates, including most recently as Senior Vice President and Head of U.S. Medical Affairs of Genentech. Prior to joining the Roche Group, Dr. Baldo served as Global Vice President, Medical Science and Affairs at The Medicines Company, a public biopharmaceuticals company, from October 2004 to February 2010. Dr. Baldo holds an MD from the University of Connecticut School of Medicine and a BA in Biology from John Hopkins University.

Francis Lo, has served as our Chief People Officer since April 2019. Prior to joining us, from March 2017 to April 2019 Mr. Lo served as Vice President, Human Resources at Whole Foods Market, Inc., a wholly-owned subsidiary of Amazon.com, Inc. that operates natural and organic food supermarkets. From August 2011 to March 2017, Mr. Lo also served in various roles of ascending responsibility with Starbucks Corporation, a public specialty coffee company, including as Director, Global Talent Management from October 2015 to March 2017. Mr. Lo holds an MBA in Business Administration from Stanford University Graduate School of Business and a BA in the Plan II Honors Program (Interdisciplinary Studies with Business Focus) from the University of Texas at Austin.

Charles Sang has served as our Senior Vice President, Clinical Diagnostics since April 2016. Prior to joining us, Mr. Sang served as the Vice President of Global Diagnostics for Nanostring Technologies, Inc., a public biotechnology company, from November 2012 to April 2016, and as the Marketing Director at Seattle Genetics, a public biotechnology company, from July 2010 to November 2012. Mr. Sang holds a BA in Psychology and Human Services from National Louis University and a master's degree in Social Work from New Mexico State University.

Sharon Benzeno, PhD, has served as our Senior Vice President, Drug Discovery since February 2018 and, before this, in business development roles of ascending responsibility with us since September 2014. Prior to joining us, Dr. Benzeno served as Senior Director at Elsevier Inc., a healthcare informatics company, from December 2013 to September 2014, as Senior Manager in the oncology business unit at Capgemini SE, a French consulting and technology services company, from May 2011 to December 2013, as Oncology Alliance Manager and Senior Scientific Manager at AstraZeneca plc from September 2005 to May 2011. Dr. Benzeno holds a PhD in Biomedical Sciences from New York University School of Medicine, an MBA in Finance and Leadership from New York University Stern School of Business and a BA in Biochemistry from New York University. Dr. Benzeno completed a postdoctoral fellowship in cancer biology at the University of Pennsylvania Abramson Cancer Center.

Nancy Hill has served as our Senior Vice President, Operations or other similar capacities since December 2013. Prior to joining us, Ms. Hill served as Vice President, Sales and Marketing and

member of the executive team at Spiration, Inc. from 2007 to 2013. Ms. Hill also served at Berlex Oncology as Vice President, Marketing from 2004 to 2005 and as Marketing Director from 2002 to 2004. Prior to that time, Ms. Hill held various positions of increasing responsibility on the new products and oncology commercial teams at Immunex Corporation and Amgen Inc. Ms. Hill holds an MBA from the Kellogg School of Management at Northwestern University and a BA in Business Administration from the University of Washington.

Non-Employee Directors

The following table sets forth certain information, as of March 31, 2019, concerning our non-employees who serve on our board of directors:

Name	Age	Position
Kevin Conroy	53	Director
Eric Dobmeier	50	Director
David Goel	49	Director
Michelle Griffin	53	Director
Robert Hershberg, PhD, MD	55	Director
Peter Neupert	63	Director
Michael Pellini, MD	53	Director
Andris Zoltners, PhD	73	Director

The following is a biographical summary of the experience of our non-employee directors.

Kevin Conroy has served on our board of directors since April 2019. Mr. Conroy has served as the President, Chief Executive Officer and Chairman of the board of directors of Exact Sciences Corporation, a public molecular diagnostic company, since March 2009. Mr. Conroy also serves on the board of directors of Epizyme, Inc., a public clinical-stage biopharmaceutical company, and Arya Sciences Acquisition Corp., a public special purpose acquisition company sponsored by an affiliate of Perceptive Advisors LLC. Prior to joining Exact Sciences Corporation, Mr. Conroy served as President and Chief Executive Officer of Third Wave Technologies, Inc., a molecular diagnostics company, from 2005 to 2008. Mr. Conroy holds a JD from the University of Michigan Law School and a BS in Electrical Engineering from Michigan State University. We believe Mr. Conroy is qualified to serve on our board of directors because of his extensive business, legal and executive leadership experience in the biotechnology industry.

Eric Dobmeier has served as a member of our board of directors since September 2016. Mr. Dobmeier has served as the President and Chief Executive Officer of Chinook Therapeutics, Inc., a biotechnology company, since April 2019. From January 2018 to June 2018, Mr. Dobmeier served as President and Chief Executive Officer of Silverback Therapeutics, Inc. and from 2002 to 2017, Mr. Dobmeier held positions of increasing responsibility at Seattle Genetics, Inc., a public biotechnology company, most recently as Chief Operating Officer from June 2011 to December 2017. Prior to joining Seattle Genetics, Mr. Dobmeier was an attorney with the law firms of Venture Law Group and Heller Ehrman LLP, where he represented technology companies in connection with public and private financings, mergers and acquisitions and corporate partnering transactions. Mr. Dobmeier currently serves on the board of directors of Atara Biotherapeutics, Inc., a publicly traded biotechnology company. He holds a JD from the University of California, Berkeley School of Law and an AB in History from Princeton University. We believe Mr. Dobmeier is qualified to serve on our board of directors based on his extensive experience in the biotechnology industry as an executive officer and director.

David Goel has served on our board of directors since September 2016. Mr. Goel is Co-Founder and sole Managing General Partner of Matrix Capital Management Company, LP, an investment fund

focused on technology and life sciences. Mr. Goel serves as a director on several private company boards and previously served as a director of Popular, Inc., a public financial services company. He is a member of the Board of Trustees of The Winsor School and the Museum of Fine Arts in Boston, Massachusetts. Mr. Goel holds a BA, *magna cum laude*, from Harvard University. We believe Mr. Goel is qualified to serve on our board of directors based on his extensive risk management, corporate governance and capital markets experience.

Michelle Griffin has served on our board of directors since March 2019. Ms. Griffin currently serves on the board of directors of Acer Therapeutics, Inc, a public company, including as chair of the audit committee. Ms. Griffin also currently serves on the board of directors of HTG Molecular Diagnostics, Inc., a public company, including as chair of the audit committee. Ms. Griffin previously served on the board of directors and as chair of the audit committee of PhaseRx, Inc., a public company, from 2016 to 2018, OncoGenex Pharmaceuticals Inc., a Nasdaq listed company, from 2008 to 2011 and Sonus Pharmaceuticals, Inc., a public company, from 2004 to 2008. Ms. Griffin served as Executive Vice President, Operations, and Chief Financial Officer at OncoGenex Pharmaceuticals, Inc. from 2011 to 2013, served as Acting Chief Executive, Senior Vice President and Chief Operating Officer at Trubion Pharmaceuticals, Inc. from 2009 until its acquisition in 2010 and as its Chief Financial Officer from 2006 to 2009; and served as Senior Vice President and Chief Financial Officer of Dendreon Corp. from 2005 to 2006. Ms. Griffin holds a BS in marketing from George Mason University and an MBA from Seattle University. We believe Ms. Griffin is qualified to serve as a member of our board of directors based on our review of her extensive operational experience in the biotechnology industry and deep experience in public company financial matters.

Robert Hershberg, PhD, MD, has served on our board of directors since February 2013. Dr. Hershberg has been employed in positions of ascending responsibility at Celgene Corporation since August 2014, and currently serves as Executive Vice President, Business Development and Global Alliances. Dr. Hershberg previously served in several roles at VentiRx Pharmaceuticals, Inc., a clinical stage biopharmaceutical company, which he co-founded in 2006, and was Chief Executive Officer of VentiRx from 2012 until the company's acquisition by Celgene in February 2017. Dr. Hershberg currently serves on the board of directors of Nanostring Technologies, Inc., and as a clinical faculty member at the University of Washington School of Medicine. Dr. Hershberg holds a PhD in Biology from the University of California, San Diego's Affiliated PhD Program with the Salk Institute for Biological Studies and an MD and a BA from the University of California, Los Angeles. We believe Dr. Hershberg is qualified to serve on our board of directors based on his extensive technical expertise and executive leadership in the biotechnology industry.

Peter Neupert has served as a member of our board of directors since December 2013. Mr. Neupert currently serves as a member of the Board of Trustees of Fred Hutch. Mr. Neupert served as an Operating Partner at Health Evolution Partners, a private equity fund, from February 2012 to July 2014. Prior to joining Health Evolution Partners, Mr. Neupert served as Corporate Vice President, Health Solutions Group at Microsoft from August 2005 to January 2012, and as the Chief Executive Officer and Chairman of the board of directors of Drugstore.com, which he founded in 1998. Mr. Neupert currently serves on the board of directors of Laboratory Corporation of America Holdings, a public clinical laboratory company, and he previously served as a member of the board of directors of NextGen Healthcare, Inc., a public software company, and several private companies. Mr. Neupert holds an MBA from the Tuck School of Business at Dartmouth College and a BA in Philosophy from Colorado College. We believe Mr. Neupert is qualified to serve on our board of directors based on his extensive experience in leadership roles in the health services sector and as a member of the board of directors of several organizations in the biotechnology industry.

Michael Pellini, MD, has served on our board of directors since February 2018. Dr. Pellini currently serves as a Managing Partner of Section 32, LLC, a technology and life sciences-based

venture capital fund. Dr. Pellini currently serves as a member of the board of directors of the Personalized Medicine Coalition and the Mission Hospital Foundation and several private companies. Dr. Pellini previously served as chairman of the board of directors, Chief Executive Officer and President at Foundation Medicine, Inc., a molecular information company, which was acquired by F. Hoffmann-La Roche Ltd. in 2018. Dr. Pellini holds an MD from Jefferson Medical College, an MBA from Drexel University and a BA in Economics from Boston College. We believe Dr. Pellini is qualified to serve on our board of directors because of his medical and clinical experience in the biotechnology industry.

Andris Zoltners, PhD, has served on our board of directors since December 2009. Dr. Zoltners currently serves as the co-chairman of ZS Associates, Inc., a global management consulting firm, which he co-founded in 1983. Dr. Zoltners currently serves as a professor emeritus of Marketing at the Kellogg School of Management at Northwestern University and previously served as a member of the Business School Faculty at the University of Massachusetts. Dr. Zoltners holds a PhD and a MSIA in Industrial Administration from Carnegie Mellon University, a M.S. in Mathematics from Purdue University and a BS in Mathematics from the University of Miami. We believe Dr. Zoltners is qualified to serve on our board of directors based on our review of his experience, qualifications, attributes and skills, including his extensive executive leadership and marketing qualifications.

Our Board of Directors

Our board of directors consists of nine members. Our directors hold office until their successors have been elected and qualified or until the earlier of their resignation or removal. Our amended and restated articles of incorporation and amended and restated bylaws that will be in effect at the closing of this offering also provide that our directors may only be removed for cause and then only by the holders of the shares entitled to elect the director or directors whose removal is sought if, with respect to a particular director, the number of votes cast in favor of removing such director (or the entire board of directors) exceeds the number of votes cast against removal, and that any vacancy on our board of directors, including a vacancy resulting from an enlargement of our board of directors, may be filled only by vote of a majority of our directors then in office.

Director Independence

Our board of directors has determined that all members of our board of directors, except Chad Robins, are independent directors for purposes of the rules of Nasdaq and the SEC. In making this determination, our board of directors considered the relationships that each non-employee director has with us and all other facts and circumstances that our board of directors deemed relevant, including the beneficial ownership of our capital stock by each non-employee director. Mr. Robins is not an independent director under these rules because he is an executive officer of our company.

Upon the closing of this offering, we expect that the composition and functioning of our board of directors and each of our committees will comply with all applicable requirements of Nasdaq and the rules and regulations of the SEC.

Family Relationships

Chad Robins, our Co-Founder, Chief Executive Officer and a member of our board of directors, is the brother of Dr. Harlan Robins, our Chief Scientific Officer and other Co-Founder. There are no other family relationships among any of our directors or executive officers.

Staggered Board

In accordance with the terms of our amended and restated articles of incorporation and amended and restated bylaws that will be in effect at the closing of this offering, our board of directors will be

divided into three staggered classes of directors and each will be assigned to one of the three classes. At each annual meeting of the shareholders, a class of directors will be elected for a three-year term to succeed the directors of the same class whose terms are then expiring. The terms of the directors will expire upon the election and qualification of successor directors at the annual meeting of shareholders to be held during the years 2020 for Class I directors, 2021 for Class II directors and 2022 for Class III directors.

- Our Class I directors will be , and ;
- Our Class II directors will be , and ; and
- Our Class III directors will be , and .

Our amended and restated articles of incorporation and amended and restated bylaws that will be in effect at the closing of this offering will provide that the number of directors shall be fixed from time to time by a resolution of the majority of our board of directors.

The division of our board of directors into three classes with staggered three-year terms may delay or prevent shareholder efforts to effect a change of our management or a change in control.

Voting Arrangements

The current members of our board of directors were elected pursuant to a sixth amended and restated voting agreement ("Voting Agreement") that we entered into with certain holders of our common stock and our convertible preferred stock, and the related provisions of our amended and restated articles of incorporation in effect prior to this offering.

Pursuant to the Voting Agreement and these provisions, our board of directors consists of:

- our Chief Executive Officer, currently Mr. Robins;
- a director designated and elected by the holders of a majority of our Series A convertible preferred stock, Series B convertible preferred stock and Series C convertible preferred stock, voting as a single class on an as-converted basis ("Preferred Director"), currently Dr. Zoltners;
- two directors designated and elected by the holders of a majority of our Series E-1 convertible preferred stock, voting as a separate class, currently Ms. Griffin and Dr. Pellini;
- one director designated and elected by the holders of a majority of the shares of our common stock and convertible preferred stock held by Mr. Robins, Dr. Robins and Chris Carlson, voting as a separate class, currently Mr. Dobmeier; and
- four directors designated and elected by a majority vote of our board of directors and approved by the Preferred Director and the holders of a majority of the shares of our common stock and convertible preferred stock held by Mr. Robins, Dr. Robins and Chris Carlson, voting as a separate class, which directors are currently Mr. Goel, Dr. Hershberg, Mr. Neupert and Mr. Conroy.

The holders of our common stock and convertible preferred stock who are parties to the Voting Agreement are obligated to vote for such designees indicated above. The provisions of the Voting Agreement will terminate upon the closing of this offering and our current amended and restated articles of incorporation will be amended and restated, after which there will be no further contractual obligations or charter provisions regarding the election of particular directors.

Following this offering, our nominating and corporate governance committee and our board of directors will consider a broad range of factors relating to the qualifications and background of

nominees. Our nominating and corporate governance committee's and our board of directors' priority in selecting board members is the identification of persons who will further the interests of our shareholders through their established record of professional accomplishment, the ability to contribute positively to the collaborative culture among board members, knowledge of our business, understanding of the competitive landscape, and professional and personal experiences and expertise relevant to our growth strategy.

Board Leadership Structure

Our corporate governance guidelines provide our board of directors with flexibility to combine or separate the positions of Chairperson of our board of directors and Chief Executive Officer and to appoint a lead independent director in accordance with its determination that using one or the other structure would be in our best interests. Chad Robins is the current Chairperson of our board of directors and Peter Neupert currently serves as the lead independent director of our board of directors.

Our board of directors has concluded that our current leadership structure is appropriate at this time. Our board of directors believes that the combined role of Chairperson and Chief Executive Officer promotes united leadership and direction and provides management a clear focus to execute our strategy and business plans. As Chief Executive Officer, Mr. Robins is best suited to ensure that critical business issues are brought before our board of directors, which enhances our board of directors' ability to develop and implement business strategies. In his role as lead independent director, Mr. Neupert presides over the independent director sessions of our board of directors in which Mr. Robins, as our Chief Executive Officer, does not participate and serves as a liaison to management on behalf of the non-employee members of our board of directors.

All directors are encouraged to suggest the inclusion of agenda items and meeting materials, and any director is free to raise at any board meeting items that are not on the agenda for that meeting.

Our non-employee directors will regularly meet in executive session without the presence of any members of management. The lead independent director presides at these meetings and provides the guidance and feedback of our non-employee directors to our Chairperson and management team.

Committees of our Board of Directors

Our board of directors has established an audit committee, a compensation committee and a nominating and corporate governance committee, each of which will operate pursuant to a charter to be adopted by our board of directors and will be effective upon the closing of this offering. Our board of directors may also establish other committees from time to time to assist the board of directors. Effective upon the closing of this offering, the composition and functioning of all of our committees will comply with all applicable requirements of the Sarbanes-Oxley Act, Nasdaq and SEC rules and regulations. Upon our listing on The Nasdaq Global Select Market, each committee's charter will be available on our website at www.adaptivebiotech.com.

Audit Committee

Effective upon the closing of this offering, , and will serve on the audit committee, which will be chaired by . Our board of directors has determined that each member of the audit committee is "independent" as that term is defined in the SEC and Nasdaq rules, meets the heightened independence requirements for audit committees required under Section 10A of the Exchange Act and related SEC and Nasdaq rules, and has sufficient knowledge in financial and auditing matters to serve on the audit committee. Our board of directors has designated as

an “audit committee financial expert,” as defined under the applicable rules of the SEC. The audit committee’s responsibilities include:

- appointing, approving the compensation of and assessing the independence of our independent registered public accounting firm;
- pre-approving auditing and permissible non-audit services, and the terms of such services, to be provided by our independent registered public accounting firm;
- reviewing the overall audit plan with our independent registered public accounting firm and members of management responsible for preparing our financial statements;
- reviewing and discussing with management and our independent registered public accounting firm our annual and quarterly financial statements and related disclosures as well as critical accounting policies and practices used by us;
- coordinating the oversight and reviewing the adequacy of our internal control over financial reporting;
- establishing policies and procedures for the receipt and retention of accounting-related complaints and concerns;
- recommending based upon the audit committee’s review and discussions with management and our independent registered public accounting firm whether our audited financial statements shall be included in our Annual Report on Form 10-K;
- monitoring the integrity of our financial statements and our compliance with legal and regulatory requirements as they relate to our financial statements and accounting matters;
- preparing the audit committee report required by SEC rules to be included in our annual proxy statement;
- reviewing all related person transactions for potential conflict of interest situations and approving all such transactions; and
- reviewing quarterly earnings releases.

Compensation Committee

Effective upon the closing of this offering , and will serve on the compensation committee, which will be chaired by . Our board of directors has determined that each member of the compensation committee is “independent” as that term is defined in SEC and Nasdaq rules, meets the heightened independence requirements for compensation committee purposes under Section 10C of the Exchange Act and related SEC and Nasdaq rules, and is a “non-employee director” under Rule 16b-3 under the Exchange Act. The compensation committee’s responsibilities include:

- reviewing and approving our philosophy, policies and plans with respect to the compensation of our chief executive officer;
- making recommendations to our board of directors with respect to the compensation of our chief executive officer and our other executive officers;
- reviewing and assessing the independence of compensation advisors;
- overseeing and administering our equity incentive plans;
- reviewing and making recommendations to our board of directors with respect to director compensation; and

- preparing the Compensation Committee reports required by the SEC, including our "Compensation Discussion and Analysis" disclosure.

Nominating and Corporate Governance Committee

Effective upon the closing of this offering , and will serve on the nominating and corporate governance committee, which will be chaired by . Our board of directors has determined that each member of the nominating and corporate governance committee is "independent" as defined in Nasdaq rules. The nominating and corporate governance committee's responsibilities include:

- developing and recommending to the board of directors criteria for board and committee membership;
- establishing procedures for identifying and evaluating board of director candidates, including nominees recommended by shareholders;
- reviewing the composition of the board of directors to ensure that it is composed of members containing the appropriate skills and expertise to advise us;
- identifying and screening individuals qualified to become members of the board of directors;
- recommending to the board of directors the persons to be nominated for election as directors and to each of the board's committees;
- developing and recommending to the board of directors a code of business conduct and ethics and a set of corporate governance guidelines; and
- overseeing the evaluation of our board of directors and management.

Compensation Committee Interlocks and Insider Participation

None of the members of our compensation committee has during the prior fiscal year been one of our officers or employees or had a relationship requiring disclosure under "*Certain Relationships and Related Party Transactions*." None of our executive officers currently serves, or in the past fiscal year has served, as a member of the board of directors or compensation committee of any entity that has one or more executive officers serving on our board of directors or compensation committee.

Code of Conduct

We have adopted a written code of business conduct, that applies to our directors, officers and employees, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions. Upon the closing of this offering, a current copy of the code will be posted on the Investor Relations section of our website at www.adaptivebiotech.com. If we make any substantive amendments to, or grant any waivers from, the code of business conduct and ethics for any officer or director, we will disclose the nature of such amendment or waiver on our website or in a current report on Form 8-K.

Non-Employee Director Compensation

The following table presents the total compensation for each person who served as a non-employee member of our board of directors during the year ended December 31, 2018. Other than as set forth in the table and described more fully below, we did not pay any compensation, make any additional equity awards or non-equity awards to or pay any other compensation to any of the

non-employee members of our board of directors in 2018. We reimburse non-employee members of our board of directors for reasonable travel and out-of-pocket expenses incurred in attending meetings of our board of directors and committees of our board of directors.

We also do not, and do not expect to, provide separate compensation to our directors who are also our employees, such as Chad Robins, our Chief Executive Officer. Mr. Robins' compensation as our principal executive officer in 2018 is reported in the "*Executive Compensation*" section of this prospectus.

Name	Option Awards ($)[1]	Total ($)
Eric Dobmeier[2]	$ 62,634	$ 62,634
David Goel[3]	—	—
Robert Hershberg, PhD, MD[4]	62,634	62,634
Arnold Levine, PhD[5]	62,634	62,634
Peter Neupert[6]	417,557	417,557
Michael Pellini, MD[7]	626,336	626,336
Tom Willis[8]	62,634	62,634
Andris Zoltners, PhD[9]	62,634	62,634

(1) In accordance with SEC rules, amounts in this column reflect the aggregate grant date fair value of stock options granted during 2018 computed in accordance with ASC Topic 718, *Compensation—Stock Compensation ("ASC 718")*, rather than the amounts paid or realized by the named individual. We provide information regarding the assumptions used to calculate the value of all stock options made to our directors in Note 13 to our audited financial statements.

(2) As of December 31, 2018, Mr. Dobmeier held options to purchase 115,000 shares of our common stock, 68,750 of which were vested as of such date.

(3) Mr. Goel did not hold any outstanding equity awards as of December 31, 2018.

(4) As of December 31, 2018, Dr. Hershberg held options to purchase 145,000 shares of our common stock, 142,500 of which were vested as of such date.

(5) Dr. Levine resigned from our board of directors in March 2019. As of December 31, 2018, Dr. Levine held options to purchase 37,084 shares of our common stock, 34,584 of which were vested as of such date.

(6) As of December 31, 2018, Mr. Neupert held options to purchase 280,000 shares of our common stock, 260,208 of which were vested as of such date.

(7) As of December 31, 2018, Dr. Pellini held options to purchase 150,000 shares of our common stock, none of which were vested as of such date.

(8) Mr. Willis resigned from our board of directors in January 2019. As of December 31, 2018, Mr. Willis held options to purchase 265,000 shares of our common stock, 231,250 of which were vested as of such date, and options to purchase 233,600 shares of our Series E-1 convertible preferred stock, all of which were vested as of such date.

(9) As of December 31, 2018, Dr. Zoltners held options to purchase 165,000 shares of our common stock, 162,500 of which were vested as of such date.

Non-Employee Director Compensation

Our board of directors intends to adopt a non-employee director compensation policy, to be effective upon the closing of this offering, that is designed to enable us to attract and retain, on a long-term basis, highly qualified non-employee directors. Specifically, we expect to provide a $40,000 annual cash payment to each director who is not an employee of ours from and after the closing of this offering, with additional amounts for those serving as Lead Independent Director and chairpersons of our audit, compensation, and nominating and corporate governance committees, as set forth below:

	Additional Annual Fee ($)
Lead Independent Director	35,000
Audit Committee Chairperson	20,000
Compensation Committee Chairperson	15,000
Nominating and Corporate Governance Committee Chairperson	10,000

In addition, subject to board discretion, each non-employee director initially elected or appointed to our board of directors following the closing of this offering will receive an option to purchase that number of shares that has a value equivalent to $340,000, with value determined in accordance with reasonable assumptions and methodologies for calculating the fair value of options under ASC 718 (as of the date of this prospectus such number would be shares), on the date of such director's election or appointment to the board of directors, with 25% of the shares vesting on the first anniversary of the vesting commencement date and 1/48th of the shares vesting in equal monthly installments thereafter, subject to continuous service through each applicable vesting date.

On the date of the first meeting of our board of directors of each calendar year, each continuing non-employee director will also receive an option to purchase that number of shares that has a value equivalent to $170,000, with value determined in accordance with reasonable assumptions and methodologies for calculating the fair value of options under ASC 718 (as of the date of this prospectus such number would be shares), which will vest in equal monthly installments over one year, subject to continued service as a director through such vesting date.

The aggregate amount of compensation, including both the grant date fair value of equity compensation and cash compensation, paid to any non-employee director in a calendar year will not exceed $750,000 for the first year of service and $600,000 for each year of service thereafter.

EXECUTIVE COMPENSATION

This section discusses the material components of the executive compensation program for our executive officers who are named in the "*—2018 Summary Compensation Table*" below. For the fiscal year ended December 31, 2018, our "named executive officers" and their positions were as follows:

- Chad Robins, Chief Executive Officer and Co-Founder;
- Julie Rubinstein, President; and
- Harlan Robins, PhD, Chief Scientific Officer and Co-Founder.

2018 Summary Compensation Table

The following table represents information regarding the total compensation awarded to, earned by or paid to our named executive officers during the fiscal year ended December 31, 2018:

Name and Principal Position	Year	Salary ($)	Option Awards ($)(1)	Non-Equity Incentive Plan Compensation ($)(2)	Total ($)
Chad Robins *CEO*	2018	422,815(3)	2,505,343	266,500	3,194,658
Julie Rubinstein *President*	2018	368,753(4)	1,670,228	187,500	2,226,481
Harlan Robins, PhD *Chief Scientific Officer*	2018	348,938(5)	1,670,228	158,500	2,177,666

(1) In accordance with SEC rules, amounts in this column reflect the aggregate grant date fair value of stock options granted during 2018 computed in accordance with ASC 718, rather than the amounts paid or realized by the named individual. We provide information regarding the assumptions used to calculate the value of all stock options made to our directors in Note 13 to our audited financial statements.

(2) Represents bonuses based upon the board of directors' assessment of the achievement of corporate performance objectives for the year ended December 31, 2018, which were paid in March 2019. See "*—Non-Equity Incentive Plan Awards*" below for details of the award plan and awards.

(3) Following the completion of our annual performance and merit review cycle, Mr. Robins' annual salary was increased from $412,000 to $426,420, effective April 1, 2018.

(4) Following the completion of our annual performance and merit review cycle, Ms. Rubenstein's annual salary was increased from $350,010 to $375,000, effective April 1, 2018.

(5) Following the completion of our annual performance and merit review cycle, Dr. Robins' annual salary was increased from $309,000 to $362,250, effective April 1, 2018.

Long-Term Equity Incentive Awards

We grant equity incentive awards intended to align the interests of our named executive officers with those of our shareholders and to motivate them to make important contributions to our performance. These awards are often subject to time-based vesting conditions. For more information see the "*—Outstanding Equity Awards at December 31, 2018*" and "*—Employee Benefit and Equity Compensation Plans*" sections of this prospectus.

Non-Equity Incentive Plan Awards

We grant non-equity incentive plan awards intended to create a direct correlation between the executive's role and responsibilities and the ability to earn variable pay. During the fiscal year ended December 31, 2018, our named executive officers were eligible to earn cash-based awards based on the achievement of corporate performance objectives. For the fiscal year ended December 31, 2018,

Chad Robins, Julie Rubinstein and Dr. Harlan Robins had an annual bonus opportunity targeted at 50%, 40% and 35% of their respective base salary. For each of our named executive officers, their annual bonus opportunity was based entirely on the achievement of corporate performance goals. For the fiscal year ended December 31, 2018, our compensation committee determined that the corporate performance goals were attained at a level of 125% and approved bonuses for the named executive officers at that level. The annual cash bonuses actually earned by each named executive officer for performance during the fiscal year ended December 31, 2018 are set forth above in the section titled "*—2018 Summary Compensation Table*" in the "*Non-Equity Incentive Plan Compensation*" column.

Employment Arrangements with our Named Executive Officers

Chad Robins

Pursuant to the terms of his amended and restated employment agreement, which will be effective on the closing of this offering, Mr. Robins will continue in his current role, on an at-will basis, and will remain eligible to participate in our fringe benefit plans, including group health insurance and vacation programs. In addition, Mr. Robins may in the future be granted equity incentive awards under our 2019 Plan, which will be effective on the closing of this offering, and any equity incentive awards granted to him under our 2009 Plan will continue to be subject to the terms and provisions of the applicable award documentation. All future and existing equity incentive awards granted to Mr. Robins will also be subject to the terms set forth in the amended and restated employment agreement providing for 100% acceleration of vesting upon a termination of his employment by us other than for death, disability or "cause" within the period beginning three months prior to and 12 months following a "change in control."

We have also entered into an employee non-disclosure and assignment agreement with Mr. Robins, under which Mr. Robins has agreed (1) not to compete with us for a period of one year after the termination of his or employment, (2) not to solicit our employees during his employment and for a period of one year after the termination of such employment, (3) to protect our confidential and proprietary information and (4) to assign to us related intellectual property developed during the course of his employment. Mr. Robins will continue to be subject to this agreement on the closing of this offering.

Julie Rubinstein

Pursuant to the terms of her amended and restated employment agreement, which will be effective on the closing of this offering, Ms. Rubinstein will continue in her current role, on an at-will basis, and will remain eligible to participate in our fringe benefit plans, including group health insurance and vacation programs. In addition, Ms. Rubinstein may in the future be granted equity incentive awards under our 2019 Plan, which will be effective on the closing of this offering, and any equity incentive awards granted to her under our 2009 Plan will continue to be subject to the terms and provisions of the applicable award documentation. All future and existing equity incentive awards granted to Ms. Rubinstein will also be subject to the terms set forth in the amended and restated employment agreement providing for 100% acceleration of vesting upon a termination of her employment by us other than for death, disability or "cause" within the period beginning three months prior to and 12 months following a "change in control."

We have also entered into an employee non-disclosure and assignment agreement with Ms. Rubinstein, under which Ms. Rubinstein has agreed (1) not to solicit our employees during her employment and for a period of one year after the termination of such employment, (2) to protect our confidential and proprietary information and (3) to assign to us related intellectual property developed during the course of her employment. Ms. Rubinstein will continue to be subject to this agreement on the closing of this offering.

Harlan Robins, PhD

Pursuant to the terms of his amended and restated employment agreement, which will be effective on the closing of this offering, Dr. Robins will continue in his current role, on an at-will basis, and will remain eligible to participate in our fringe benefit plans, including group health insurance and vacation programs. In addition, Dr. Robins may in the future be granted equity incentive awards under our 2019 Plan, which will be effective on the closing of this offering, and any equity incentive awards granted to him under our 2009 Plan will continue to be subject to the terms and provisions of the applicable award documentation. All future and existing equity incentive awards granted to Dr. Robins will also be subject to the terms set forth in the amended and restated employment agreement providing for 100% acceleration of vesting upon a termination of his employment by us other than for death, disability or "cause" within the period beginning three months prior to and 12 months following a "change in control."

We have also entered into an employee non-disclosure and assignment agreement with Dr. Robins, under which Dr. Robins has agreed (1) not to compete with us for a period of one year after the termination of his or employment, (2) not to solicit our employees during his employment and for a period of one year after the termination of such employment, (3) to protect our confidential and proprietary information and (4) to assign to us related intellectual property developed during the course of his employment. Dr. Robins will continue to be subject to this agreement on the closing of this offering.

Certain Definitions

For purposes of the employment agreements of each of our named executive officers:

- "Cause" means (i) theft, dishonesty, willful misconduct, breach of fiduciary duty for personal profit or falsification of any of our documents or records by the executive, (ii) the executive's material failure to abide by our code of conduct or other policies, (iii) the executive's unauthorized use, misappropriation, destruction or diversion of our assets or corporate opportunity, (iv) any intentional act by the executive which has a material detrimental effect on our reputation or business, (v) the executive's repeated failure or inability to perform any reasonable assigned duties after written notice of, and a reasonable opportunity to cure, such failure or inability, (vi) the executive's material breach of any employment, service, non-disclosure, non-competition, non-solicitation or other similar agreement between the executive and us, which breach is not cured pursuant to the terms of such agreement or (vii) the executive's conviction of any criminal act involving fraud, dishonesty, misappropriation or moral turpitude, or which impairs the executive's ability to perform his or her duties with us.
- "Change in Control" means (i) any person or entity becoming a beneficial owner of our securities representing more than 50% of the total fair market value or total combined voting power of our then-outstanding securities entitled to vote generally in the election of directors, unless such degree of beneficial ownership results from (a) an acquisition by a person or entity who was a beneficial owner of more than 50% of such voting power on the effective date of our 2009 Plan, (b) any acquisition directly from us, (c) any acquisition by us, a trustee or other fiduciary under our employee benefit plan, or an entity owned by our shareholders in substantially the same proportions as their ownership of our voting securities; or (ii) an ownership change transaction in which our shareholders immediately before such transaction do not retain immediately after the transaction, direct or indirect beneficial ownership of more than 50% of the total combined voting power of our outstanding securities entitled to vote generally in the election of directors or the entity to which our assets were transferred; or (iii) our liquidation or dissolution. Notwithstanding the foregoing, a "change of control" does not include a transaction described in (i) or (ii) in which a majority of the board of directors of the

continuing, surviving or successor entity, or parent thereof, immediately after such transaction is comprised of our incumbent directors.

Outstanding Equity Awards at December 31, 2018

The following table presents information regarding outstanding equity awards held by our named executive officers as of December 31, 2018. All awards were granted under our 2009 Plan.

		Option Awards			
Name	Grant Date	Number of Securities Underlying Unexercised Options (#) Exercisable	Number of Securities Underlying Unexercised Options (#) Unexercisable	Option Exercise Price ($)	Option Expiration Date
Chad Robins[1]	12/20/2011	800,000[2]	—	0.33	12/20/2021
CEO	6/9/2015	800,000[3]	100,000	6.32	6/9/2025
	2/7/2018	600,000[4]	425,000	6.55	2/7/2028
Julie Rubinstein[1]	7/19/2011	100,000[5]	—	0.33	7/19/2021
President	12/20/2011	25,000[2]	—	0.33	12/20/2021
	8/21/2012	70,000[6]	—	0.45	8/21/2022
	2/4/2013	100,000[7]	—	0.45	2/4/2023
	11/3/2013	65,000[8]	—	0.84	11/3/2023
	3/13/2014	360,000[9]	—	0.84	3/13/2024
	6/9/2015	500,000[3]	62,500	6.32	6/9/2025
	2/7/2018	400,000[4]	283,334	6.55	2/7/2028
Harlan Robins, PhD[1]	6/9/2015	600,000[3]	75,000	6.32	6/9/2025
Chief Scientific Officer	2/7/2018	400,000[4]	283,334	6.55	2/7/2028

(1) Each equity award is subject to the acceleration of vesting provisions in each named executive officer's amended and restated employment agreement, as set forth above in the section titled "*—Employment Arrangements with our Named Executive Officers*."
(2) The shares underlying this option vested 25% on January 1, 2013, then in 36 equal monthly installments thereafter.
(3) The shares underlying this option vested 25% on June 8, 2016, then in 36 equal monthly installments thereafter.
(4) The shares underlying this option vested 25% on November 1, 2018, then in 36 equal monthly installments thereafter.
(5) The shares underlying this option vested 25% on May 1, 2012, then in 36 equal monthly installments thereafter.
(6) The shares underlying this option vested 25% on July 1, 2013, then in 36 equal monthly installments thereafter.
(7) The shares underlying this option vested 25% on January 1, 2014, then in 36 equal monthly installments thereafter.
(8) The shares underlying this option vested 25% on November 3, 2014, then in 36 equal monthly installments thereafter.
(9) The shares underlying this option vested 100% upon the date of grant on March 13, 2014.

Employee Benefit and Equity Compensation Plans

The principal features of our employee benefit and equity incentive plans are summarized below. These summaries are qualified in their entirety by reference to the actual text of our plans, each of which is filed as an exhibit to the registration statement of which this prospectus is a part.

2019 Equity Incentive Plan

Our 2019 Plan was approved by our board of directors and our shareholders in , 2019. It is intended to make available incentives that will assist us to attract, retain and motivate employees,

including officers, consultants and directors. We may provide these incentives through the grant of stock options, stock appreciation rights, restricted stock, restricted stock units, performance shares and units and other cash-based or share-based awards.

A total of shares of our common stock will be initially authorized and reserved for issuance under our 2019 Plan. This reserve will automatically increase on January 1, 2020 and each subsequent anniversary by an amount equal to the smaller of (a) 5.0% of the number of shares of common stock issued and outstanding on the immediately preceding December 31 or (b) an amount determined by our board of directors. In addition, this reserve will be increased to include up to shares that remained available for grant under our 2009 Plan upon its termination or that are subject to options granted under our 2009 Plan that expire or terminate without having been exercised in full.

Appropriate adjustments will be made in the number of authorized shares and other numerical limits in our 2019 Plan and in outstanding awards to prevent dilution or enlargement of participants' rights in the event of a stock split or other change in our capital structure. Shares subject to awards which expire or are cancelled or forfeited will again become available for issuance under our 2019 Plan. The shares available will not be reduced by awards settled in cash or by shares withheld to satisfy tax withholding obligations. Only the net number of shares issued upon the exercise of stock appreciation rights or options exercised by means of a net exercise or by tender of previously owned shares will be deducted from the shares available under our 2019 Plan.

Our 2019 Plan will be generally administered by our compensation committee. Subject to the provisions of our 2019 Plan, our compensation committee will determine in its discretion the persons to whom and the times at which awards are granted, the sizes of such awards and all of their terms and conditions. However, our compensation committee may delegate to one or more of our officers the authority to grant awards to persons who are not officers or directors, subject to certain limitations contained in our 2019 Plan and award guidelines established by our compensation committee. Our compensation committee will have the authority to construe and interpret the terms of our 2019 Plan and awards granted under it. Our 2019 Plan provides, subject to certain limitations, for indemnification by us of any director, officer or employee against all reasonable expenses, including attorneys' fees, incurred in connection with any legal action arising from such person's action or failure to act in administering our 2019 Plan.

Our 2019 Plan will authorize our compensation committee, without further shareholder approval, to provide for the cancellation of stock options or stock appreciation rights with exercise prices in excess of the fair market value of the underlying shares of common stock in exchange for new options or other equity awards with exercise prices equal to the fair market value of the underlying common stock or a cash payment.

Our 2019 Plan limits the grant date fair value of all equity awards and the amount of cash compensation that may be provided to a non-employee director in any fiscal year to an aggregate of $750,000 for the first year of service and $600,000 for each year of service thereafter.

Awards may be granted under our 2019 Plan to our employees, including officers, directors or consultants or those of any future parent or subsidiary corporation or other affiliated entity. All awards will be evidenced by a written agreement between us and the holder of the award and may include any of the following:

- *Stock options*: We may grant non-statutory stock options or incentive stock options (as described in Section 422 of the Code), each of which gives its holder the right, during a specified term (not exceeding 10 years) and subject to any specified vesting or other

conditions, to purchase a number of shares of our common stock at an exercise price per share determined by the administrator, which may not be less than the fair market value of a share of our common stock on the date of grant.

- *Stock appreciation rights*: A stock appreciation right gives its holder the right, during a specified term (not exceeding 10 years) and subject to any specified vesting or other conditions, to receive the appreciation in the fair market value of our common stock between the date of grant of the award and the date of its exercise. We may pay the appreciation in shares of our common stock or in cash.
- *Restricted stock*: The administrator may grant restricted stock awards either as a bonus or as a purchase right at such price as the administrator determines. Shares of restricted stock remain subject to forfeiture until vested, based on such terms and conditions as the administrator specifies. Holders of restricted stock will have the right to vote the shares and to receive any dividends paid, except that the dividends will be subject to the same vesting conditions as the related shares.
- *Restricted stock units*: Restricted stock units represent rights to receive shares of our common stock (or their value in cash) at a future date without payment of a purchase price, subject to vesting or other conditions specified by the administrator. Holders of restricted stock units have no voting rights or rights to receive cash dividends unless and until shares of common stock are issued in settlement of such awards. However, the administrator may grant restricted stock units that entitle their holders to dividend equivalent rights subject to the same vesting conditions as the related units.
- *Performance shares and performance units*: Performance shares and performance units are awards that will result in a payment to their holder only if specified performance goals are achieved during a specified performance period. Performance share awards are rights denominated in shares of our common stock, while performance unit awards are rights denominated in dollars. The administrator establishes the applicable performance goals based on one or more measures of business performance enumerated in our 2019 Plan, such as revenue, gross margin, net income or total shareholder return. To the extent earned, performance share and unit awards may be settled in cash or in shares of our common stock. Holders of performance shares or performance units have no voting rights or rights to receive cash dividends unless and until shares of common stock are issued in settlement of such awards. However, the administrator may grant performance shares that entitle their holders to dividend equivalent rights subject to the same vesting conditions as the related units.
- *Cash-based awards and other share-based awards*: The administrator may grant cash-based awards that specify a monetary payment or range of payments or other share-based awards that specify a number or range of shares or units that, in either case, are subject to vesting or other conditions specified by the administrator. Settlement of these awards may be in cash or shares of our common stock, as determined by the administrator. Their holder will have no voting rights or right to receive cash dividends unless and until shares of our common stock are issued pursuant to the award. The administrator may grant dividend equivalent rights with respect to other share-based awards.

In the event of a change in control as described in our 2019 Plan, the acquiring or successor entity may assume or continue all or any awards outstanding under our 2019 Plan or substitute substantially equivalent awards. Any awards which are not assumed or continued in connection with a change in control or are not exercised or settled prior to the change in control will terminate effective as of the time of the change in control. Our compensation committee may provide for the acceleration of vesting of any or all outstanding awards upon such terms and to such extent as it determines, except that the vesting of all awards held by members of our board of directors who are not employees will

automatically be accelerated in full in the event of a change in control. Our 2019 Plan will also authorize the compensation committee, in its discretion and without the consent of any participant, to cancel each or any outstanding award denominated in shares upon a change in control in exchange for a payment to the participant with respect to each share subject to the cancelled award of an amount equal to the excess of the consideration to be paid per share of common stock in the change in control transaction over the exercise price per share, if any, under the award.

Our 2019 Plan will continue in effect until it is terminated by the administrator, provided, however, that all awards will be granted, if at all, within 10 years of its effective date. The administrator may amend, suspend or terminate our 2019 Plan at any time, provided that without shareholder approval, our 2019 Plan cannot be amended to increase the number of shares authorized, change the class of persons eligible to receive incentive stock options or effect any other change that would require shareholder approval under any applicable law or listing rule.

Awards under our 2019 Plan generally may not be transferred or assigned except by will or by the laws of descent and distribution, unless otherwise determined by the plan administrator and subject to applicable securities laws.

2009 Equity Incentive Plan

Our 2009 Plan was originally adopted by our board of directors and approved by our shareholders on December 17, 2009. The maximum aggregate number of shares of common stock that may be issued under our 2009 Plan is 22,848,899. Upon the closing of this offering, our board of directors will terminate our 2009 Plan and we will not grant any further awards under such plan, but our 2009 Plan will continue to govern outstanding awards granted thereunder. Our compensation committee administers our 2009 Plan and has the authority, among other things, to construe and interpret the terms of our 2009 Plan and awards granted thereunder.

Our 2009 Plan permits the grant of options, stock appreciation rights, restricted stock purchase rights, restricted stock bonuses, restricted stock units, performance shares, performance units, cash-based awards and other share-based awards. As of March 31, 2019, we had options to purchase 16,851,722 shares of common stock outstanding under our 2009 Plan. Appropriate and proportionate adjustments will be made to the number of shares subject to outstanding awards to prevent dilution or enlargement of participants' rights in the event of a recapitalization, reclassification, stock dividend, stock split, reverse stock split, split-up, split-off, spin-off, combination of shares, exchange of shares or similar change in our capital structure, or in the event of payment of a dividend or distribution to the our shareholders in a form other than shares (excepting normal cash dividends).

In its discretion, our compensation committee may provide for acceleration of the exercisability, vesting or settlement of awards in connection with a "change in control," as defined under our 2009 Plan, of each or any outstanding award or portion thereof and common stock acquired pursuant thereto upon such conditions, including termination of the plan participant's service prior to, upon or following such change in control, and to such extent as our compensation committee determines. In the event of a change in control, the surviving, continuing, successor or purchasing corporation or other business entity or parent thereof, as the case may be, may, without the consent of any plan participant, either assume or continue the rights and obligations under each or any award or portion thereof outstanding immediately prior to the change in control or substitute for each or any such outstanding award or portion thereof a substantially equivalent award with respect to its own stock, as applicable. Any award or portion thereof which is neither assumed nor continued by the surviving, continuing, successor or purchasing corporation or other business entity or parent thereof in connection with the change in control nor exercised or settled as of the time of consummation of the change in control shall terminate and cease to be outstanding effective as of the time of consummation of the change in control.

Sequenta 2008 Stock Plan

In connection with our Sequenta Acquisition, we assumed our Sequenta Plan, including all awards that were then-outstanding under our Sequenta Plan. We have not granted any further awards following our assumption of our Sequenta Plan. Our Sequenta Plan terminated pursuant to its terms in 2018, but all outstanding awards thereunder continue to be governed by their existing terms. Our compensation committee administers our Sequenta Plan and has the authority, among other things, to construe and interpret the terms of our Sequenta Plan and awards granted thereunder.

As of March 31, 2019, there were 31,077 stock options to purchase shares of our Series E-1 convertible preferred stock outstanding under our Sequenta Plan. In connection with the closing of this offering, all outstanding stock options to purchase shares of our Series E-1 convertible preferred stock under our Sequenta Plan will convert into stock options to purchase shares of our common stock. Appropriate and proportionate adjustments will be made to the number of shares subject to outstanding awards to prevent dilution or enlargement of participants' rights in the event of a recapitalization, reclassification, stock dividend, stock split, reverse stock split, split-up, split-off, spin-off, combination of shares, exchange of shares or similar change in our capital structure, or in the event of payment of a dividend or distribution to our shareholders in a form other than shares (excepting normal cash dividends). In the event of a merger or "change in control" (as defined in our Sequenta Plan), each outstanding award will be treated as the plan administrator determines, including, without limitation, that each award be assumed or an equivalent award substituted by the successor corporation or a parent or subsidiary of the successor corporation, provided that in the event of a change of control in which the successor corporation does not assume or substitute for an award under such plan, an awardee shall fully vest in and have the right to exercise his or her outstanding awards, including shares as to which such award would not otherwise be vested or exercisable, and restrictions on all of the awardee's restricted stock shall lapse.

2019 Employee Stock Purchase Plan

Our ESPP was approved by our board of directors in April 2019 and our shareholders in 2019. A total of shares of our common stock are available for sale under our ESPP. In addition, our ESPP provides for annual increases in the number of shares available for issuance under our ESPP on January 1, 2020 and each subsequent anniversary, equal to the smaller of:

- 1.0% of the outstanding shares of our common stock on the immediately preceding December 31; or
- such other amount as may be determined by our compensation committee.

Appropriate adjustments will be made in the number of authorized shares and in outstanding purchase rights to prevent dilution or enlargement of participants' rights in the event of a stock split or other change in our capital structure. Shares subject to purchase rights which expire or are cancelled will again become available for issuance under the ESPP.

Our compensation committee will administer our ESPP and have full authority to interpret the terms of our ESPP. Our ESPP provides, subject to certain limitations, for indemnification by us of any director, officer or employee against all reasonable expenses, including attorneys' fees, incurred in connection with any legal action arising from such person's action or failure to act in administering our ESPP.

All of our employees, including our named executive officers, are eligible to participate if they are customarily employed by us for more than 20 hours per week and more than five months in any calendar year, subject to any local law requirements applicable to participants in jurisdictions outside

the United States. However, an employee may not be granted rights to purchase stock under our ESPP if such employee:

- immediately after the grant would own stock or options to purchase stock possessing 5.0% or more of the total combined voting power or value of all classes of our capital stock; or
- holds rights to purchase stock under any of our employee stock purchase plans that would accrue at a rate that exceeds $25,000 worth of our stock for each calendar year in which the right to be granted would be outstanding at any time.

Our ESPP is intended to qualify under Section 423 of the Code but also permits us to include our non-U.S. employees in offerings not intended to qualify under Section 423. Our ESPP will typically be implemented through consecutive six-month offering periods. The offering periods will be determined by our compensation committee in its sole discretion. In addition, our compensation committee may, in its discretion, modify the terms of future offering periods, including establishing offering periods of up to 27 months and providing for multiple purchase dates. Our compensation committee may vary certain terms and conditions of separate offerings for employees of any future non-U.S. subsidiaries where required by local law or desirable to obtain intended tax or accounting treatment.

Our ESPP permits participants to purchase common stock through payroll deductions of up to 15.0% of their eligible compensation.

Amounts deducted and accumulated from participant compensation, or otherwise funded in any participating non-U.S. jurisdiction in which payroll deductions are not permitted, are used to purchase shares of our common stock at the end of each offering period. The purchase price of the shares will be 85.0% of the lower of the fair market value of our common stock on the first trading day of the offering period and the fair market value of our common stock on the last day of the offering period. Participants may end their participation at any time during an offering period and will be paid their accrued payroll deductions that have not yet been used to purchase shares of common stock. Participation ends automatically upon termination of employment with us.

Each participant in any offering will have an option to purchase for each full month contained in the offering period a number of shares determined by dividing $2,083.33 by the fair market value of a share of our common stock on the first day of the offering period or 300 shares, if less, and except as limited in order to comply with Section 423 of the Code. Prior to the beginning of any offering period, our compensation committee may alter the maximum number of shares that may be purchased by any participant during the offering period or specify a maximum aggregate number of shares that may be purchased by all participants in the offering period. If insufficient shares remain available under our ESPP to permit all participants to purchase the number of shares to which they would otherwise be entitled, our compensation committee will make a pro rata allocation of the available shares. Any amounts withheld from participants' compensation in excess of the amounts used to purchase shares will be refunded, without interest.

A participant may not transfer rights granted under our ESPP other than by will, the laws of descent and distribution or as otherwise provided under our ESPP.

In the event of a change in control, an acquiring or successor corporation may assume our rights and obligations under outstanding purchase rights or substitute substantially equivalent purchase rights. If the acquiring or successor corporation does not assume or substitute for outstanding purchase rights, then the purchase date of the offering periods then in progress will be accelerated to a date prior to the change in control.

Our ESPP will continue in effect until terminated by our compensation committee. Our compensation committee has the authority to amend, suspend or terminate our ESPP at any time.

401(k) Plan

Effective as of January 1, 2012, we adopted a tax-qualified retirement plan that provides eligible employees with an opportunity to save for retirement on a tax-advantaged basis. All participants' interests in their contributions are 100% vested when contributed. Under the plan, we can make discretionary matching contributions, although we did not do so in 2018. The retirement plan is intended to qualify under Sections 401(a) and 501(a) of the Code.

Health and Welfare Plans

All of our full-time employees, including our named executive officers, are eligible to participate in our health and welfare plans, including medical and dental benefits, short-term and long-term disability insurance, and life insurance.

Limitation of Liability and Indemnification Matters

Our amended and restated articles of incorporation and our amended and restated bylaws which will be in effect upon the closing of this offering will provide that we will indemnify our directors and officers to the fullest extent permitted under the laws of the State of Washington. Under the WBCA, our amended and restated articles of incorporation may contain provisions not inconsistent with law that eliminate or limit the personal liability of our directors for monetary damages for conduct as directors, except for the following:

- acts or omissions that involve intentional misconduct by a director or a knowing violation of law by a director;
- conduct violating RCW 23B.08.310 relating to unlawful distributions;
- any transaction from which the director will personally receive a benefit in money, property or services to which the director is not legally entitled; or
- any act or omission occurring prior to the date when the provision eliminating or limiting the liability of our directors becomes effective.

Our amended and restated articles of incorporation, upon the closing of this offering, will also provide that if Washington law is amended to authorize corporate action further eliminating or limiting the personal liability of a director, then the liability of our directors will be eliminated or limited to the fullest extent permitted by Washington law, as so amended. We may also purchase and maintain liability insurance on behalf of our directors, officers, employees and agents. We currently maintain a liability insurance policy pursuant to which our directors and officers may be indemnified against liability incurred as a result of serving in their capacities as directors and officers, subject to certain exclusions.

We have entered into indemnification agreements with each of our current directors and executive officers, and may enter into indemnification agreements with future directors and executive officers, to provide such directors and officers additional contractual assurances regarding the scope of the indemnification set forth in our amended and restated articles of incorporation and amended and restated bylaws and to provide additional procedural protections.

We believe these charter provisions and indemnification agreements are necessary to attract and retain qualified persons as directors and executive officers.

The above description of the relevant portions of Washington law, and the indemnification provisions of our amended and restated articles of incorporation, our amended and restated bylaws and our indemnification agreements, is not complete and is qualified in its entirety by reference to the WBCA, our amended and restated articles of incorporation, our amended and restated bylaws and the indemnification agreements between us and our directors and executive officers, each of which is filed as an exhibit to our registration statement of which this prospectus forms a part.

The limitation of liability and indemnification provisions in our amended and restated articles of incorporation and amended and restated bylaws may discourage shareholders from bringing a lawsuit against our directors and officers for breach of their fiduciary duty. They may also reduce the likelihood of derivative litigation against our directors and officers, even though an action, if successful, might benefit us and our shareholders. Further, a shareholder's investment may be adversely affected to the extent that we pay the costs of settlement and damage awards against directors and officers as required by these indemnification provisions.

The indemnification provisions in our amended and restated articles of incorporation and amended and restated bylaws and the indemnification agreements entered into or to be entered into between us and each of our directors and executive officers may not be sufficiently broad to permit indemnification of our directors and executive officers for liabilities arising under the Securities Act.

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers or persons controlling us pursuant to the foregoing provisions, we have been informed that, in the opinion of the SEC, such indemnification is against public policy as expressed in the Securities Act and is therefore unenforceable.

There is no pending litigation or proceeding naming any of our directors or officers as to which indemnification is being sought, nor are we aware of any pending or threatened litigation that may result in claims for indemnification by any director or officer.

CERTAIN RELATIONSHIPS AND RELATED PARTY TRANSACTIONS

Other than the compensation agreements and other arrangements described in the "*Executive Compensation*" section of this prospectus and the transactions described below, since January 1, 2016, there has not been and there is not currently proposed, any transaction or series of similar transactions to which we were, or will be, a party in which the amount involved exceeded, or will exceed, $120,000 and in which any director, executive officer, holder of 5% or more of any class of our capital stock or any member of the immediate family of, or entities affiliated with, any of the foregoing persons, had, or will have, a direct or indirect material interest.

Private Placement of Securities

On December 11, 2017 we entered into a Series F-1 Preferred Stock Purchase Agreement, pursuant to which we issued and sold an aggregate of 4,686,649 shares of our Series F-1 convertible preferred stock at a price per share of $10.6686, for an aggregate purchase price of $49,999,984. The following table sets forth the number of shares of our Series F-1 convertible preferred stock that we issued to entities under common control with certain of our 5% shareholders and their affiliates in this transaction:

Name	Shares of Series F-1 Convertible Preferred Stock	Total Purchase Price
Viking Global Entities(1)	290,572	$ 3,099,996
Matrix Capital Management Master Fund, LP(2)(3)	84,359	899,992

(1) Viking Global Entities consists of Viking Global Equities Master Ltd., Viking Global Equities II LP, Viking Long Fund Master Ltd. and Viking Global Opportunities Illiquid Investments Sub-Master LP ("Viking Global Entities"), and collectively hold 5% or more of our capital stock.
(2) David Goel, one of our directors, is the sole Managing General Partner of Matrix Capital Management Company, LP.
(3) Matrix Capital Management Master Fund, LP is a holder of 5% or more of our capital stock.

Agreements with our Shareholders

In connection with our Series F-1 convertible preferred stock financing, we entered into a sixth amended and restated investors' rights agreement and the Voting Agreement, in each case, with the purchasers of our Series F-1 convertible preferred stock and certain holders of our common and convertible preferred stock, including Viking Global Equities Master Ltd., Viking Long Fund Master Ltd., Viking Global Equities II LP and Matrix Capital Management Master Fund, LP. The Voting Agreement contains provisions with respect to the election of our board of directors and its composition. The Voting Agreement will terminate automatically upon the closing of this offering.

On May 30, 2019, we entered into a seventh amended and restated investors' rights agreement ("Investors' Rights Agreement"), which superseded our sixth amended and restated investors' rights agreement. In addition to certain registration rights, the Investors' Rights Agreement provides for certain information rights, rights of first offer and rights of first refusal.

See the "*Description of Capital Stock—Registration Rights*" section of this prospectus for more information regarding the registration rights provided in this agreement.

The provisions described above, except for the registration rights, will terminate automatically upon the closing of this offering. This is not a complete description of the Investors' Rights Agreement and is qualified by the full text of the Investors' Rights Agreement filed as an exhibit to the registration statement of which this prospectus is a part.

Side Letter Agreement

In connection with our Series F-1 convertible preferred stock financing, we entered into a side letter agreement with the Viking Global Entities, collectively a greater than 5% beneficial owner of our common stock, which we amended and restated in April 2019 ("Letter Agreement"). The Letter Agreement imposes on the Viking Global Entities certain standstill and support obligations until the earlier of our consummation of a change of control transaction, April 3, 2024, and the date on which they cease to have beneficial ownership of at least 10% of any class of our voting securities.

With respect to the standstill obligations, the Viking Global Entities have agreed, subject to certain exceptions, not to (i) acquire beneficial ownership of any additional shares of our common stock or other securities; (ii) transfer any shares of our common stock issued upon conversion of our convertible preferred stock to our competitors, or to any other person if, after the transfer, the transferee would beneficially own more than 10% of our capital stock and, to the knowledge of the transferor, be involved any of the actions prohibited by clauses (iii) or (iv); (iii) make, vote for or encourage any proposal to amend our amended and restated bylaws that our board of directors has recommended against, approve any shareholder proposal that our board of directors has recommended against or approve any "significant business transaction" as defined under the WBCA in which the Viking Global Entities would be a buyer in such transaction; (iv) encourage any third party to commence a tender offer for shares of our common stock, solicit shareholder proxies with respect to any matter, call a special meeting of our shareholders or make a request for a list of our shareholders; or (v) form, join in or participate in a "group" (within the meaning of the Exchange Act) for the purpose of acting in a concerted manner.

With respect to the support obligations, each of the Viking Global Entities has agreed that it will cause all of our shares of capital stock legally or beneficially owned by it to be voted in favor of any proposal that both (i) has been recommended by our board of directors and (ii) relates to a transaction that would constitute a change of control, but only, at the option of such Viking Global Entity, as recommended by our board of directors or in the same proportions as all of our other shareholders voting on such proposal. Each of the Viking Global Entities has granted our chief executive officer a proxy to vote its shares in accordance with the support obligations, subject to certain exceptions.

Adaptimmune Master Collaboration Agreement

We are party to a master collaboration agreement with Adaptimmune Limited, pursuant to which we provide Adaptimmune with certain services related to our ImmunoSEQ product and service pursuant to agreed upon project orders. David Goel, one of our directors, is sole Managing General Partner of Matrix Capital Management Master Fund, LP, which owns greater than 10% of the outstanding equity interest in Adaptimmune. In the fiscal year ended December 31, 2017, Adaptimmune paid us $128,000 for services provided under the master collaboration agreement.

ZS Associates Master Services Agreement

We are party to a management services agreement, which was extended to August 2019 by amendment, with ZS Associates, pursuant to which ZS Associates provides us with certain sales and marketing services pursuant to agreed-upon work orders. Andris Zoltners, PhD, one of our directors, is a Co-Chairman and Founding Director of ZS Associates. For the fiscal year ended December 31, 2018, we paid ZS Associates $143,000 for services provided under the management services agreement.

Executive Severance Agreements

We have entered into executive severance agreements with certain of our executive officers that provide, cash benefits if the officer is terminated without cause or resigns for good reason (as defined in each officer's respective executive severance agreement, an "Involuntary Separation"), subject to that officer entering into a release of claims with us.

In the event of an Involuntary Separation, Dr. Baldo's, executive severance agreement provides that he would receive a multiple of his base salary depending on the length of his service with us at the time of separation: (i) if less than 12 months of service, 12 months of base salary; (ii) if greater than 12 months, but less than 24 months of service, six months of base salary; or (iii) if greater than 24 months of service, three months of base salary. Similarly, in the event of an Involuntary Separation, Mr. Cohen would receive three months base salary and Mr. Sang would receive 12 months base salary.

Indemnification Agreements

We have entered into agreements to indemnify our directors and executive officers. These agreements, among other things, require us to indemnify these individuals for certain expenses (including attorneys' fees), judgments, fines and settlement amounts reasonably incurred by such person in any action or proceeding, including any action by or in our right, on account of any services undertaken by such person on behalf of us or that person's status as a member of our board of directors to the maximum extent allowed under Washington law.

Policies and Procedures for Related Party Transactions

Our board of directors has adopted a written policy with respect to related person transactions, to be effective upon the closing of this offering, setting forth the policies and procedures for the review and approval or ratification of related person transactions. Under the policy, related person transactions that are identified as such prior to the consummation or amendment of such transaction may be consummated or amended only if certain steps are taken, including review and approval by our audit committee. In the event we become aware of a related person transaction that has not been previously approved or previously ratified under the policy, the transaction is submitted to our audit committee for review and ratification, amendment, termination or rescission as the audit committee deems appropriate. For purposes of this policy, related person transactions mean transactions in which we were or are to be a participant, where the amount involved exceeds $120,000 and a related person had, has or will have a direct or indirect material interest. For purposes of this policy, a related person means a director, executive officer, nominee for director or greater than 5% beneficial owner of our common stock, in each case since the beginning of the most recently completed year, and such person's immediate family members.

PRINCIPAL SHAREHOLDERS

The following table sets forth information regarding the beneficial ownership of our common stock by:

- each person or group of affiliated persons known by us to be the beneficial owner of more than 5% of our capital stock;
- each of our named executive officers;
- each of our directors; and
- all of our directors and executive officers as a group.

Beneficial ownership is determined in accordance with the rules of the SEC and generally includes voting or investment power with respect to securities. Common stock issuable upon exercise or conversion of options, warrants or other rights to acquire common stock that are currently exercisable or convertible, or exercisable or convertible within 60 days of March 31, 2019 are deemed to be outstanding and beneficially owned by the holder for the purpose of computing share and percentage ownership of that holder, but are not treated as outstanding for the purpose of computing the percentage ownership of any other person. Except as indicated in the footnotes to the table below, and subject to community property laws where applicable, we believe the persons and entities named in the table below have sole voting and investment power with respect to all common stock shown as beneficially owned by them.

In the table below, the percentage of beneficial ownership before this offering is based on 105,954,230 shares of common stock outstanding as of March 31, 2019, assuming the conversion of all outstanding shares of our convertible preferred stock into an aggregate of 93,023,694 shares of common stock upon the closing of this offering, and the percentage of beneficial ownership after this offering further assumes the issuance of shares of common stock in this offering, assuming no exercise of the underwriters' option to purchase additional shares. Unless otherwise indicated, the address of each of the individuals and entities named below is c/o Adaptive Biotechnologies Corporation, 1551 Eastlake Avenue East, Suite 200, Seattle, Washington 98102.

Name of Beneficial Owner	Number of Shares Beneficially Owned Prior to Offering	Percentage of Shares Beneficially Owned	
		Before this Offering	After this Offering
5% and Greater Shareholders:			
Viking Global Entities(1)	38,156,607	36.0%	%
Matrix Capital Management Master Fund, LP(2)	17,332,191	16.4	
Named Executive Officers and Directors:			
Chad Robins(3)	6,754,013	6.3	
Julie Rubinstein(4)	1,359,583	1.3	
Harlan Robins, PhD(5)	1,608,179	1.5	
Eric Dobmeier(6)	86,666	*	
David Goel(2)	17,332,191	16.4	
Michelle Griffin	—	—	
Robert Hershberg, PhD, MD(7)	148,750	*	
Peter Neupert(8)	286,250	*	
Michael Pellini, MD(9)	50,625	*	
Andris Zoltners, PhD(10)	4,034,766	3.8	
All directors and executive officers as a group (15 persons)	33,752,896	30.0	

* Represents beneficial ownership of less than 1% of our outstanding common stock.

(1) Consists of (i) 26,405,953 shares of common stock held by Viking Global Equities Master Ltd. ("VGE Master"), (ii) 538,898 shares of common stock held by Viking Global Equities II LP ("VGE II"), (iii) 9,786,756 shares of common stock held by Viking Long Fund Master Ltd. ("VLF") and (iv) 1,425,000 shares of common stock held by Viking Global Opportunities Illiquid Investments Sub-Master LP ("Viking Opportunities," and together with VGE Master, VGE II, VLF and Viking Opportunities, the "Viking Global Entities"). VGE Master has the power to dispose of and vote the shares directly owned by it, which power may be exercised by its investment manager, Viking Global Performance LLC ("VGP"), and by Viking Global Investors LP ("VGI"), which provides managerial services to VGE Master. VGE II has the power to dispose of and vote the shares directly owned by it, which power may be exercised by its general partner, VGP, and by VGI, which provides managerial services to VGE II. VLF has the power to dispose of and vote the shares directly owned by it, which power may be exercised by its investment manager, Viking Long Fund GP LLC ("VLFGP"), and by VGI, which provides managerial services to VLF. Viking Opportunities has the power to dispose of and vote the shares directly owned by it, which power may be exercised by its general partner, Viking Global Opportunities Portfolio GP LLC ("Viking Opportunities GP"), and by VGI, which provides managerial services to Viking Opportunities. O. Andreas Halvorsen, David C. Ott and Rose Shabet, as Executive Committee members of Viking Global Partners LLC (the general partner of VGI), VGP, VLFGP and Viking Opportunities GP, have shared power to direct the voting and disposition of investments beneficially owned by VGI, VGP, VLFGP and Viking Opportunities GP. The business address of each of the Viking Global Entities is c/o Viking Global Investors LP, 55 Railroad Avenue, Greenwich, Connecticut 06830.

(2) Matrix Capital Management Company, LP, the investment adviser of Matrix Capital Management Master Fund, LP ("Matrix Fund"), has discretionary authority to vote and dispose of the shares held by the Matrix Fund and may be deemed to be the beneficial owner of these shares. David Goel, a member of our board of directors, in his capacity as the sole Managing General Partner of Matrix Capital Management Company, LP, may also be deemed to have investment and voting power over the shares held by the Matrix Fund. The registered office of Matrix Capital Management Master Fund, LP is c/o Matrix Capital Management Company, LP, 1000 Winter Street, Suite 4500, Waltham, MA 02451.

(3) Consists of (i) 1,858,180 shares of common stock held directly by Chad Robins, (ii) 1,808,333 shares of common stock issuable upon exercise of options exercisable within 60 days of March 31, 2019, (iii) 2,237,500 shares of common stock held by South Dakota Trust Company, Trustee of the Harlan Robins 2017 Trust, for the benefit of Dr. Harlan Robins and his descendants and of which Mr. Robins is a trustee, (iv) 500,000 shares of common stock held by HSR 2014 Mother's Trust UTA dated June 17, 2014 for the benefit of Mr. Robins' mother and daughter and of which Mr. Robins is a trustee and (v) 350,000 shares of common stock held by HSR 2017 Trust for Descendants, u/a/d November 10, 2017 for the benefit of Dr. Robins' descendants and of which Mr. Robins is trustee.

(4) Consists of 1,359,583 shares of common stock issuable upon exercise of options exercisable within 60 days of March 31, 2019.

(5) Consists of (i) 70,679 shares of common stock held directly by Dr. Harlan Robins, (ii) 737,500 shares of common stock issuable upon exercise of options exercisable within 60 days of March 31, 2019, (iii) 300,000 shares of common stock held by CMR 2014 Brother's Trust u/t/a dated July 2, 2014 for the benefit of Dr. Robins and of which Dr. Robins is a trustee and (iv) 500,000 shares of common stock held by CMR 2014 Mother's Trust u/t/a dated July 2, 2014 for the benefit of Dr. Robins' mother and Chad Robins' daughter and of which Dr. Robins is a trustee.

(6) Consists of 86,666 shares of common stock issuable upon exercise of options exercisable within 60 days of March 31, 2019.

(7) Consists of 148,750 shares of common stock issuable upon exercise of options exercisable within 60 days of March 31, 2019.

(8) Consists of 286,250 shares of common stock issuable upon exercise of options exercisable within 60 days of March 31, 2019.

(9) Consists of 50,625 shares of common stock issuable upon exercise of options exercisable within 60 days of March 31, 2019.

(10) Consists of (i) 3,866,016 shares of common stock and (ii) 168,750 shares of common stock issuable upon exercise of options exercisable within 60 days of March 31, 2019.

DESCRIPTION OF CAPITAL STOCK

The following summary describes our capital stock and the provisions of our amended and restated articles of incorporation, amended and restated bylaws and amended and restated investors' rights agreement that will be in effect upon the closing of this offering. Copies of these documents are filed with the SEC as exhibits to our registration statement of which this prospectus forms a part. The descriptions of our common stock and convertible preferred stock reflect changes to our capital structure that will occur in connection with the closing of this offering.

General

Upon the closing of this offering, our authorized capital stock will consist of 340,000,000 shares of common stock, par value $0.0001 per share, and 10,000,000 shares of preferred stock, par value $0.0001 per share, all of which shares of preferred stock will be undesignated.

As of March 31, 2019, 12,930,536 shares of our common stock and 93,023,694 shares of convertible preferred stock were outstanding and held by 315 shareholders of record. This amount does not take into account the conversion of all outstanding shares of our convertible preferred stock into common stock upon the closing of this offering.

Common Stock

The holders of our common stock are entitled to one vote for each share held on all matters submitted to a vote of the shareholders. The holders of our common stock do not have any cumulative voting rights. Holders of our common stock are entitled to receive ratably any dividends declared by our board of directors out of funds legally available for that purpose, subject to any preferential dividend rights of any outstanding convertible preferred stock. Our common stock has no preemptive rights, conversion rights or other subscription rights or redemption or sinking fund provisions.

In the event of our liquidation, dissolution or winding up, holders of our common stock will be entitled to share ratably in all assets remaining after payment of all debts and other liabilities and any liquidation preference of any outstanding convertible preferred stock. The shares to be issued by us in this offering will be, when issued and paid for, fully paid and non-assessable.

Preferred Stock

Upon the closing of this offering, all outstanding shares of our convertible preferred stock will be converted into shares of our common stock on a one-to-one basis. Following that conversion and the effectiveness of our amended and restated articles of incorporation, our board of directors will have the authority, without further action by our shareholders, to issue up to 10,000,000 shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions thereof. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences and the number of shares constituting, or the designation of, such series, any or all of which may be greater than the rights of common stock. The issuance of our preferred stock could adversely affect the voting power of holders of common stock and the likelihood that such holders will receive dividend payments and payments upon our liquidation. In addition, the issuance of preferred stock could have the effect of delaying, deferring or preventing a change in control of our company or other corporate action. Immediately after the closing of this offering, no shares of preferred stock will be outstanding, and we have no present plan to issue any shares of preferred stock.

Stock Options

As of March 31, 2019, options to purchase 31,077 shares of our Series E-1 convertible preferred stock were outstanding under our Sequenta Plan, of which 31,077 were vested and exercisable as of that date, and options to purchase 16,851,722 shares of our common stock were outstanding under our 2009 Plan, of which 10,590,560 were vested and exercisable as of that date. In addition, shares of common stock are reserved for future issuance under our 2019 Plan.

Warrants

As of March 31, 2019, warrants to purchase a total of 55,032 shares of common stock were outstanding, with exercise prices ranging from $0.33 per share to $0.45 per share and a weighted-average exercise price of $0.37 per share. Of these, a warrant to purchase 20,000 shares of our common stock will expire upon the closing of this offering unless earlier exercised, with the remaining warrant to purchase 35,032 shares of our common stock expiring in June 2022. In addition, as of March 31, 2019, a warrant to purchase 56,875 shares of our convertible preferred stock was outstanding, with an exercise price of $2.64 per share. This will convert into a warrant to purchase an equivalent number of shares of our common stock upon the closing of this offering, and will expire in April 2021.

Registration Rights

Upon the closing of this offering, holders of shares of our common stock, which shares we refer to as “registrable securities,” will be entitled to rights with respect to the registration of these registrable securities under the Securities Act. These rights are provided under the terms of the Investors’ Rights Agreement. The Investors’ Rights Agreement includes demand registration rights, short-form registration rights and piggyback registration rights.

All underwriting discounts, selling commissions and stock transfer taxes applicable to the sale of registrable securities pursuant to the Investors’ Rights Agreement shall be borne by the holders of registrable securities participating in such sale. Any additional expenses incurred in connection with exercise of registration rights under the Investors’ Rights Agreement, including all registration, filing and qualification fees, printers’ and accounting fees, and fees and disbursements of our counsel shall be borne by us. We are also responsible for the reasonable fees and disbursements, not to exceed $100,000, or such greater amount as agreed upon in the applicable underwriting agreement, of one counsel for the selling holders of registrable securities, and any legal expenses incurred by such selling holders in excess of $100,000 shall be borne by such holders.

Subject to certain exceptions contained in the Investors’ Rights Agreement, we and the underwriters may limit the number of shares included in an underwritten offering by holders of registrable securities to the number of shares which we and the underwriters determine in our sole discretion will not jeopardize the success of the offering.

Demand Registration Rights

Beginning six months after the closing date of this offering, the holders of registrable securities are entitled to demand registration rights under certain conditions. Under the terms of the Investors’ Rights Agreement, we will be required, upon the written request of (i) holders of at least 30% of registrable securities then outstanding or (ii) the Viking Global Entities (so long as the Viking Global Entities remain a holder of at least 550,000 registrable securities), to use our best efforts to file a registration statement on Form S-1 or Form S-3 with respect to the registrable securities identified

by the holders initiating such request so long as the anticipated aggregate offering price of such registrable securities pursuant to such registration would be at least $5.0 million in the aggregate. We are not obligated to effect, or to take any action to effect, any registration pursuant to these demand registration rights (a) during the period that is 30 days before our good faith estimate of the date of filing of, and ending on a date that is 60 days after the effective date of, a registration statement pertaining to an underwritten public offering of our securities or (b) after we have effected five registrations pursuant to these demand registration rights if the initiating holder for at least two of such registrations is one of the Viking Global Entities.

Shelf Registration Rights

Pursuant to the Investors' Rights Agreement, beginning six months after the closing date of this offering, upon the written request of (i) holders of at least 20% of registrable securities then outstanding or (ii) one of the Viking Global Entities (so long as one of the Viking Global Entities remains a holder of at least 550,000 registrable securities), we will be required to use commercially reasonable efforts to effect a registration of with respect to the registrable securities identified by the holders initiating such request by filing either a shelf registration statement on Form S-3 or an evergreen registration statement on Form S-1 with the SEC. We are not obligated to effect, or to take any action to effect, any registration pursuant to these registration rights (i) if the holders of registrable securities intending to sell pursuant to such rights propose to sell registrable securities at an aggregate offering price to the public, net of selling expenses, of less than $2.0 million or (ii) if we furnish to such initiating holders a certificate signed by the chair of our board of directors stating that in the good-faith judgment of our board of directors, after consultation with our outside counsel, it would be materially detrimental to us and our shareholders for such registration to be effected at such time, subject to certain limitations.

An offering or sale of registrable securities pursuant to a shelf registration statement may be initiated at any time by one or more holders of at least 550,000 shares of registrable securities, provided that the minimum market value of registrable securities that such holders propose to sell in such offering must be equal to at least $1.0 million or such lower amount approved by our board of directors. The right to have such shares registered on a shelf registration statement is further subject to other specified conditions and limitations.

Piggyback Registration Rights

Pursuant to the Investors' Rights Agreement, if we register any of our securities either for our own account or for the account of other security holders, subject to certain exceptions, the holders of registrable securities are entitled to include their shares in the registration.

Expiration of Registration Rights

The demand registration rights, short form registration rights and piggyback registration rights granted to any holder of registrable securities under the Investors' Rights Agreement will terminate upon the earliest to occur of (i) the fifth anniversary of the closing of this offering or (ii) such time after this offering when the holder's registrable securities may be sold without restriction pursuant to Rule 144 within a 90-day period; provided, however, that the demand registration rights, short-form registration rights and piggyback registration rights under the Investors' Rights Agreement of any holder of at least 550,000 shares of registrable securities shall not terminate until such time as such holder holds no registrable securities.

Anti-Takeover Effects of our Articles of Incorporation, Bylaws and Washington Law

Our amended and restated articles of incorporation and amended and restated bylaws will include a number of provisions that may have the effect of delaying, deferring or preventing another party from acquiring control of us and encouraging persons considering unsolicited tender offers or other unilateral takeover proposals to negotiate with our board of directors rather than pursue non-negotiated takeover attempts. These provisions include the items described below.

Board Composition and Filling Vacancies

Our amended and restated articles of incorporation will provide for the division of our board of directors into three classes serving staggered three-year terms, with one class being elected each year. Our amended and restated articles of incorporation will also provide that directors may be removed only for cause and then only if the number of votes of the holders of the shares entitled to elect the director cast in favor of removing such director exceeds the number of votes cast against removal. Furthermore, any vacancy on our board of directors, however occurring, including a vacancy resulting from an increase in the size of our board, may only be filled by the affirmative vote of a majority of our remaining directors. The classification of directors, together with the limitations on removal of directors and treatment of vacancies, has the effect of making it more difficult for shareholders to change the composition of our board of directors.

Unanimous Written Consent of Shareholders

Washington law limits the ability of shareholders to act by written consent by requiring unanimous written consent for shareholder action to be effective. This limit may lengthen the amount of time required to take shareholder actions and would prevent the amendment of our amended and restated articles of incorporation, our amended and restated bylaws or removal of directors by our shareholders without holding a meeting of shareholders.

Meetings of Shareholders

Our amended and restated articles of incorporation and our amended and restated bylaws will provide that only our board of directors, our Chairperson of our board of directors, our Chief Executive Officer or our President may call special meetings of shareholders and only those matters set forth in the notice of the special meeting may be considered or acted upon at a special meeting of shareholders. Our amended and restated bylaws will limit the business that may be conducted at an annual meeting of shareholders to those matters properly brought before the meeting.

Advance Notice Requirements

Our amended and restated bylaws will establish advance notice procedures with regard to shareholder proposals relating to the nomination of candidates for election as directors or new business to be brought before meetings of our shareholders. These procedures provide that notice of shareholder proposals must be timely given in writing to our corporate secretary prior to the meeting at which the action is to be taken. Generally, to be timely, notice must be received at our principal executive offices not less than 90 days nor more than 120 days prior to the first anniversary of the date that our proxy statement was released to shareholders in connection with the previous year’s annual meeting. Our amended and restated bylaws will specify the requirements as to form and content of all shareholders’ notices. These requirements may preclude shareholders from bringing matters before the shareholders at an annual or special meeting.

Amendment to our Articles of Incorporation and Bylaws

Any amendment of our amended and restated articles of incorporation must first be submitted to our shareholders by us or our board of directors, and the amendment of certain articles or sections,

including articles or sections relating to who may call special meetings of the shareholders, our board of directors, indemnification of our directors and officers, supermajority voting and amendments to our amended and restated bylaws, requires the affirmative vote of at least two-thirds of the outstanding shares entitled to vote on the amendment voting together as a single group. Our amended and restated bylaws may be amended by our board of directors, subject to any limitations set forth in our amended and restated bylaws, and may also be amended by the affirmative vote of at least two-thirds of the outstanding shares entitled to vote on the amendment voting together as a single group.

Undesignated Preferred Stock

Our amended and restated articles of incorporation will provide for authorized shares of preferred stock. The existence of authorized but unissued shares of preferred stock may enable our board of directors to discourage an attempt to obtain control of us by means of a merger, tender offer, proxy contest or otherwise. For example, if in the due exercise of its fiduciary obligations, our board of directors were to determine that a takeover proposal is not in the best interests of our shareholders, our board of directors could cause shares of preferred stock to be issued without shareholder approval in one or more private offerings or other transactions that might dilute the voting or other rights of the proposed acquirer or insurgent shareholder or shareholder group. In this regard, our amended and restated articles of incorporation will grant our board of directors broad power to establish the rights and preferences of authorized and unissued shares of preferred stock. The issuance of shares of preferred stock could decrease the amount of earnings and assets available for distribution to holders of shares of common stock. The issuance may also adversely affect the rights and powers, including voting rights, of these holders and may have the effect of delaying, deterring or preventing a change in control of us.

Exclusive Forum

Our amended and restated articles of incorporation that will be in effect at the closing of this offering will provide that, unless we consent in writing to the selection of an alternative forum, the state courts located in King County, Washington (or, if the state courts located within King County, Washington do not have jurisdiction, the federal district court for the Western District of Washington) shall be the sole and exclusive forum for commencing and maintaining any proceeding (i) asserting a claim based on a violation of a duty under the laws of the State of Washington by any of our current or former directors, officers or shareholders in such capacity, (ii) commenced or maintained in the right of the corporation, (iii) asserting a claim arising pursuant to any provision of the WBCA, our amended and restated articles of incorporation or our amended and restated bylaws (as either may be amended from time to time) or (iv) asserting a claim concerning our internal affairs that is not included in clauses (i) through (iii) above, in all cases to the fullest extent permitted by law and subject to the court having personal jurisdiction over the indispensable parties named as defendants. These provisions would not apply to suits brought to enforce a duty or liability created by the Exchange Act, or any other claim for which the federal courts have exclusive jurisdiction. Our amended and restated articles of incorporation will further provide that the federal district courts of the United States of America will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act, subject to applicable law. Any person or entity purchasing or otherwise acquiring any interest in our securities shall be deemed to have notice of and consented to these provisions. Our exclusive forum provision will not relieve us of our duties to comply with the federal securities laws and the rules and regulations thereunder, and our shareholders will not be deemed to have waived our compliance with these laws, rules and regulations. Although we believe these provisions benefit us by providing increased consistency in the application of Washington law for the specified types of actions and proceedings, the provisions may have the effect of discouraging lawsuits against us or our directors, officers and other employees.

Washington Anti-Takeover Law

Washington law imposes restrictions on some transactions between a corporation and significant shareholders. Chapter 23B.19 of the WBCA generally prohibits a target corporation from engaging in specified "significant business transactions" with an "acquiring person." This statute could prohibit or delay the accomplishment of mergers or other takeover or change in control attempts with respect to us and, accordingly, may discourage unsolicited attempts to acquire us. An "acquiring person" is generally defined as a person or group of persons that beneficially owns the voting shares entitled to cast votes comprising 10% or more of the voting power of the target corporation. The target corporation may not engage in "significant business transactions," as defined in Chapter 23B.19, for a period of five years after the date of the transaction in which the person became an acquiring person, unless (1) the significant business transaction or the acquiring person's purchase of shares was approved by a majority of the members of the target corporation's board of directors prior to the share acquisition causing the person to become an "acquiring person," or (2) the significant business transaction was both approved by the majority of the members of the target corporation's board of directors and authorized at a shareholder meeting by at least two-thirds of the votes entitled to be cast by the outstanding voting shares (excluding the acquiring person's shares or shares over which the acquiring person has voting control) at or subsequent to the acquiring person's share acquisition. "Significant business transactions" include, among other things:

- a merger or share exchange with, disposition of assets to or issuance or redemption of stock to or from, the acquiring person;
- a termination of 5% or more of the employees of the target corporation employed in the State of Washington as a result of the acquiring person's acquisition of 10% or more of the shares, whether at one time or over the five-year period following the share acquisition;
- a transaction in which the acquiring person is allowed to receive a disproportionate benefit as a shareholder; or
- liquidating or dissolving the target corporation.

After the five-year period, a "significant business transaction" may occur, as long as it complies with "fair price" provisions specified in the statute or is approved at a meeting of shareholders by a majority of the votes entitled to be counted within each voting group entitled to vote separately on the transaction, not counting the votes of shares as to which the acquiring person has beneficial ownership or voting control. A corporation may not opt out of this statute.

Nasdaq Global Select Market listing

We have applied to list our common stock on The Nasdaq Global Select Market under the symbol "ADPT."

Transfer Agent and Registrar

The transfer agent and registrar for our common stock will be Computershare Trust Company, N.A. The transfer agent and registrar's address is 250 Royall Street, Canton, Massachusetts 02021.

SHARES ELIGIBLE FOR FUTURE SALE

Prior to this offering, there has been no public market for our common stock. Future sales of our common stock in the public market, or the availability of such shares for sale in the public market, could adversely affect market prices prevailing from time to time. As described below, only a limited number of shares will be available for sale shortly after this offering due to contractual and legal restrictions on resale. Nevertheless, sales of our common stock in the public market after such restrictions lapse, or the perception that such sales may occur, could adversely affect the prevailing market price at such time and our ability to raise equity capital in the future.

Based on the number of shares of our common stock outstanding as of March 31, 2019, upon the closing of this offering, shares of our common stock will be outstanding assuming no exercise of the underwriters' option to purchase additional shares of common stock and no exercise of outstanding options or warrants. Of the outstanding shares of our common stock, all of the shares sold in this offering will be freely tradable, except that any such shares of our common stock acquired by our affiliates, as that term is defined in Rule 144 under the Securities Act, may only be sold by them in compliance with the limitations described below. All remaining shares of our common stock held by existing shareholders immediately prior to the closing of this offering will be "restricted securities" as that term is defined in Rule 144. These restricted securities may be offered and sold to the public only if registered under the Securities Act or if an exemption from registration is available, including the exemptions provided by Rule 144 or Rule 701, summarized below.

Subject to the provisions of Rule 144 or Rule 701, shares will be available for sale in the public market as follows:

- beginning on the date of this prospectus, all of the shares sold in this offering will be immediately available for sale in the public market; and
- beginning 181 days after the date of this prospectus, additional shares will become eligible for sale in the public market, of which shares will be held by affiliates and subject to the volume and other restrictions of Rule 144, as described below.

Rule 144

In general, a person who has beneficially owned restricted securities for at least six months may be entitled to sell the person's securities, subject to certain conditions. If the person is not deemed to be one of our affiliates at the time of the sale or at any time during the 90 days preceding it, we have been subject to the Exchange Act periodic reporting requirements for at least 90 days and we have made all filings under the Exchange Act necessary for the current public information requirements of Rule 144, then the non-affiliate may sell its shares. The non-affiliate may sell without regard to the current public information requirements of Rule 144 if it has beneficially owned the shares for 12 months and we have been subject to the Exchange Act periodic reporting requirements for at least 90 days.

If the person is deemed to be one of our affiliates at the time of the sale or at any time during the 90 days preceding it, and the affiliate has beneficially owned the shares to be sold for at least six months, the affiliate may sell up to the following volume limitations in any three-month period:

- 1% of the number of shares of our common stock then outstanding, which will equal approximately shares immediately after this offering, assuming no exercise of the underwriters' option to purchase additional shares, based on the number of shares outstanding as of March 31, 2019; or

- the average weekly trading volume of our common stock on The Nasdaq Global Select Market during the four calendar weeks preceding the filing of a notice on Form 144 with respect to such sale;

provided, in each case, that we have been subject to the Exchange Act periodic reporting requirements for at least 90 days, we have made all filings under the Exchange Act necessary for the current public information requirements of Rule 144, and the affiliate complies with the manner of sale and notice provisions of Rule 144.

Rule 701

Rule 701 under the Securities Act, as in effect on the date of this prospectus, permits resales of stock in reliance upon Rule 144 but without compliance with certain restrictions of Rule 144, including the holding period requirement. Most of our employees, executive officers or directors who purchased shares under a written compensatory plan or contract may be entitled to rely on the resale provisions of Rule 701, but all holders of Rule 701 shares are required to wait until 90 days after the date of this prospectus before selling their shares.

Lock-Up Agreements

We, our directors and executive officers and holders of substantially all of our common stock have signed lock-up agreements that prevent us and them from selling any of our common stock or any securities convertible into or exercisable or exchangeable for common stock for a period of not less than 180 days from the date of this prospectus without the prior written consent of the underwriters, subject to certain exceptions. See the "*Underwriting*" section of this prospectus for more information.

Registration Rights

Upon the closing of this offering, holders of shares of our common stock will be entitled to various rights with respect to registration of their shares of our common stock under the Securities Act. Registration of these shares under the Securities Act would result in these shares becoming fully tradable without restriction under the Securities Act immediately upon the effectiveness of the registration statement. See the "*Description of Capital Stock—Registration Rights*" section of this prospectus for more information.

Equity Incentive Plans

We intend to file one or more registration statements on Form S-8 under the Securities Act to register shares of our common stock issued or reserved for issuance under our equity incentive plans. The first such registration statement is expected to be filed soon after the date of this prospectus and will automatically become effective upon filing with the SEC. Accordingly, shares registered under such registration statement will be available for sale in the open market, unless such shares are subject to vesting restrictions with us or the lock-up restrictions described above. As of March 31, 2019, we estimate that such registration statement on Form S-8 will cover approximately of shares of our common stock.

MATERIAL U.S. FEDERAL INCOME TAX CONSEQUENCES TO NON-U.S. HOLDERS

The following is a summary of the material U.S. federal income tax consequences to non-U.S. holders (as defined below) of the ownership and disposition of our common stock issued pursuant to this offering. This discussion is not a complete analysis of all potential U.S. federal income tax consequences relating thereto, does not address the potential application of the Medicare contribution tax on net investment income, and does not address any estate or gift tax consequences (other than those specifically set forth below) or any tax consequences arising under any state, local or foreign tax laws, or any other U.S. federal tax laws. This discussion is based on the Code, Treasury Regulations promulgated thereunder, judicial decisions and published rulings and administrative pronouncements of the IRS, all as in effect on the date of this prospectus. These authorities are subject to differing interpretations and may change, possibly retroactively, resulting in U.S. federal income tax consequences different from those discussed below. We have not requested a ruling from the IRS with respect to the statements made and the conclusions reached in the following summary, and there can be no assurance that the IRS or a court will agree with such statements and conclusions.

This discussion is limited to non-U.S. holders who purchase our common stock pursuant to this offering and who hold our common stock as a "capital asset" within the meaning of Section 1221 of the Code (generally, property held for investment). This discussion does not address all of the U.S. federal income tax consequences that may be relevant to an individual holder in light of such holder's particular circumstances. This discussion also does not consider any specific facts or circumstances that may be relevant to holders subject to special rules under the U.S. federal income tax laws, including:

- certain former citizens or long-term residents of the United States;
- partnerships or other pass-through entities (and investors therein);
- "controlled foreign corporations";
- "passive foreign investment companies";
- corporations that accumulate earnings to avoid U.S. federal income tax;
- banks, financial institutions, investment funds, insurance companies, brokers, dealers or traders in securities;
- tax-exempt organizations and governmental organizations;
- tax-qualified retirement plans;
- persons subject to the alternative minimum tax;
- persons subject to special tax accounting rules under Section 451(b) of the Code;
- persons that own or have owned, actually or constructively, more than 5% of our common stock;
- persons who have elected to mark securities to market; and
- persons holding our common stock as part of a hedging or conversion transaction or straddle, or a constructive sale, or other risk reduction strategy or integrated investment.

If an entity or arrangement that is classified as a partnership for U.S. federal income tax purposes holds our common stock, the U.S. federal income tax treatment of a partner in the partnership will generally depend on the status of the partner and the activities of the partnership. Partnerships holding our common stock and the partners in such partnerships are urged to consult their tax advisors about the particular U.S. federal income tax consequences to them of holding and disposing of our common stock.

PROSPECTIVE INVESTORS SHOULD CONSULT THEIR TAX ADVISORS REGARDING THE PARTICULAR U.S. FEDERAL INCOME TAX CONSEQUENCES TO THEM OF ACQUIRING, OWNING AND DISPOSING OF OUR COMMON STOCK, AS WELL AS ANY TAX CONSEQUENCES ARISING UNDER ANY STATE, LOCAL OR FOREIGN TAX LAWS AND ANY OTHER U.S. FEDERAL TAX LAWS. IN ADDITION, SIGNIFICANT CHANGES IN U.S. FEDERAL TAX LAWS WERE RECENTLY ENACTED. PROSPECTIVE INVESTORS SHOULD ALSO CONSULT WITH THEIR TAX ADVISORS WITH RESPECT TO SUCH CHANGES IN U.S. TAX LAW AS WELL AS POTENTIAL CONFORMING CHANGES IN STATE TAX LAWS.

Definition of Non-U.S. Holder

For purposes of this discussion, a non-U.S. holder is any beneficial owner of our common stock that is not a "U.S. person" or a partnership (including any entity or arrangement treated as a partnership) for U.S. federal income tax purposes. A U.S. person is any person that, for U.S. federal income tax purposes, is or is treated as any of the following:

- an individual who is a citizen or resident of the United States;
- a corporation (including any entity treated as a corporation for U.S. federal income tax purposes) created or organized under the laws of the United States, any state thereof or the District of Columbia;
- an estate, the income of which is subject to U.S. federal income tax regardless of its source; or
- a trust (1) whose administration is subject to the primary supervision of a U.S. court and which has one or more U.S. persons who have the authority to control all substantial decisions of the trust or (2) that has a valid election in effect under applicable Treasury Regulations to be treated as a U.S. person.

Distributions on Our Common Stock

If we distribute cash or other property on our common stock, such distributions will constitute dividends for U.S. federal income tax purposes to the extent paid from our current or accumulated earnings and profits, as determined under U.S. federal income tax principles. Amounts distributed in excess of our current and accumulated earnings and profits will constitute a return of capital and will first be applied against and reduce a holder's tax basis in our common stock, but not below zero. Any distribution in excess of basis will be treated as gain realized on the sale or other disposition of our common stock and will be treated as described in the "*Distributions on Our Common Stock—Gain On Disposition of Our Common Stock*" section below.

Subject to the discussion below regarding effectively connected income, backup withholding and FATCA (as defined below), dividends paid to a non-U.S. holder of our common stock generally will be subject to U.S. federal withholding tax at a rate of 30% of the gross amount of the dividends or such lower rate specified by an applicable income tax treaty. To receive the benefit of a reduced treaty rate, a non-U.S. holder must furnish us or our withholding agent with a valid IRS Form W-8BEN or IRS Form W-8BEN-E (or applicable form) certifying such non-U.S. holder's qualification for the reduced rate. This certification must be provided to us or our withholding agent before the payment of dividends and must be updated periodically. If the non-U.S. holder holds our common stock through a financial institution or other agent acting on the non-U.S. holder's behalf, the non-U.S. holder will be required to provide appropriate documentation to the agent, which then will be required to provide certification to us or our withholding agent, either directly or through other intermediaries.

If a non-U.S. holder holds our common stock in connection with the conduct of a trade or business in the United States, and dividends paid on our common stock are effectively connected with

such holder's U.S. trade or business (and are attributable to such holder's permanent establishment or fixed base in the United States if required by an applicable tax treaty), the non-U.S. holder will generally be exempt from U.S. federal withholding tax, provided that the non-U.S. holder furnishes a valid IRS Form W-8ECI (or applicable successor form) to the applicable withholding agent.

However, any such effectively connected dividends paid on our common stock generally will be subject to U.S. federal income tax on a net income basis at the regular U.S. federal income tax rates in the same manner as if such holder were a resident of the United States. A non-U.S. holder that is a foreign corporation also may be subject to an additional branch profits tax equal to 30% (or such lower rate specified by an applicable income tax treaty) of its effectively connected earnings and profits for the taxable year, as adjusted for certain items.

Non-U.S. holders that do not provide the required certification on a timely basis, but that qualify for a reduced treaty rate, may obtain a refund of any excess amounts withheld by timely filing an appropriate claim for refund with the IRS. Non-U.S. holders should consult their tax advisors regarding any applicable income tax treaties that may provide for different rules.

Gain on Disposition of Our Common Stock

Subject to the discussion below regarding backup withholding and FATCA, a non-U.S. holder generally will not be subject to U.S. federal income tax on any gain realized on the sale or other disposition of our common stock, unless:

- the gain is effectively connected with the non-U.S. holder's conduct of a trade or business in the United States and, if required by an applicable income tax treaty, is attributable to a permanent establishment or fixed base maintained by the non-U.S. holder in the United States;
- the non-U.S. holder is a nonresident alien individual present in the United States for 183 days or more during the taxable year of the disposition, and certain other requirements are met; or
- our common stock constitutes a "U.S. real property interest" by reason of our status as a U.S. real property holding corporation ("USRPHC"), for U.S. federal income tax purposes at any time within the shorter of the five-year period preceding the disposition or the non-U.S. holder's holding period for our common stock, and our common stock is not regularly traded on an established securities market during the calendar year in which the sale or other disposition occurs.

Determining whether we are a USRPHC depends on the fair market value of our U.S. real property interests relative to the fair market value of our other trade or business assets and our foreign real property interests. We believe we are not currently and we do not anticipate becoming a USRPHC for U.S. federal income tax purposes, although there can be no assurance we will not in the future become a USRPHC.

Gain described in the first bullet point above generally will be subject to U.S. federal income tax on a net income basis at the regular U.S. federal income tax rates in the same manner as if such holder were a resident of the United States. A non-U.S. holder that is a foreign corporation also may be subject to an additional branch profits tax equal to 30% (or such lower rate specified by an applicable income tax treaty) of its effectively connected earnings and profits for the taxable year, as adjusted for certain items. Gain described in the second bullet point above will be subject to U.S. federal income tax at a flat 30% rate (or such lower rate specified by an applicable income tax treaty), but may be offset by certain U.S.-source capital losses (even though the individual is not considered a resident of the United States), provided that the non-U.S. holder has timely filed U.S. federal income tax returns with respect to such losses. Gain described in the third bullet point above will generally be subject to U.S.

federal income tax in the same manner as gain that is effectively connected with the conduct of a U.S. trade or business (subject to any provisions under an applicable income tax treaty), except that the branch profits tax generally will not apply.

Non-U.S. holders should consult their tax advisors regarding any applicable income tax treaties that may provide for different rules.

U.S. Federal Estate Tax

The estates of nonresident alien individuals generally are subject to U.S. federal estate tax on property with a U.S. situs. Because we are a U.S. corporation, our common stock will be U.S. situs property and, therefore, will be included in the taxable estate of a nonresident alien decedent, unless an applicable estate tax treaty between the United States and the decedent's country of residence provides otherwise. The terms "resident" and "nonresident" are defined differently for U.S. federal estate tax purposes than for U.S. federal income tax purposes. Investors are urged to consult their own tax advisors regarding the U.S. federal estate tax consequences of the ownership or disposition of our common stock.

Information Reporting and Backup Withholding

Annual reports are required to be filed with the IRS and provided to each non-U.S. holder indicating the amount of dividends on our common stock paid to such holder and the amount of any tax withheld with respect to those dividends. These information reporting requirements apply even if no withholding was required because the dividends were effectively connected with the holder's conduct of a U.S. trade or business, or withholding was reduced or eliminated by an applicable income tax treaty. This information also may be made available under a specific treaty or agreement with the tax authorities in the country in which the non-U.S. holder resides or is established.

Backup withholding, currently at a 24% rate, generally will not apply to payments to a non-U.S. holder of dividends on or the gross proceeds of a disposition of, our common stock provided the non-U.S. holder furnishes the required certification for its non-U.S. status, such as by providing a valid IRS Form W-8BEN, IRS Form W-8BEN-E or IRS Form W-8ECI, or certain other requirements are met. Backup withholding may apply if the payor has actual knowledge, or reason to know, that the holder is a U.S. person who is not an exempt recipient.

Backup withholding is not an additional tax. If any amount is withheld under the backup withholding rules, the non-U.S. holder should consult with a U.S. tax advisor regarding the possibility of and procedure for obtaining a refund or a credit against the non-U.S. holder's U.S. federal income tax liability, if any.

Withholding on Foreign Entities

The Foreign Account Tax Compliance Act ("FATCA"), as reflected in Sections 1471 through 1474 of the Code), imposes a U.S. federal withholding tax of 30% on certain payments made to a "foreign financial institution" (as specially defined under these rules) unless such institution enters into an agreement with the U.S. government to withhold on certain payments and to collect and provide to the U.S. tax authorities substantial information regarding certain U.S. account holders of such institution (which includes certain equity and debt holders of such institution, as well as certain account holders that are foreign entities with U.S. owners) or an exemption applies. FATCA also generally will impose a U.S. federal withholding tax of 30% on certain payments made to a non-financial foreign entity

unless such entity provides the withholding agent a certification identifying certain direct and indirect U.S. owners of the entity or an exemption applies. An intergovernmental agreement between the United States and an applicable foreign country may modify these requirements. Under certain circumstances, a non-U.S. holder might be eligible for refunds or credits of such taxes. FATCA currently applies to dividends paid on our common stock. Subject to the recently released proposed Treasury Regulations described below, withholding under FATCA will also generally apply to gross proceeds from sales or other dispositions of our common stock after December 31, 2018. The U.S. Department of the Treasury recently released proposed regulations that, if finalized in their present form, would eliminate the federal withholding tax of 30% applicable to gross proceeds from sales or other dispositions of our common stock. In its preamble to such proposed regulations, the U.S. Treasury Department stated that taxpayers may generally rely on the proposed regulations until final regulations are issued.

Prospective investors are encouraged to consult with their own tax advisors regarding the possible implications of FATCA on their investment in our common stock.

UNDERWRITING

We and the underwriters named below intend to enter into an underwriting agreement with respect to the shares being offered. Subject to certain conditions, each underwriter has severally agreed to purchase the number of shares indicated in the following table. Goldman Sachs & Co. LLC, J.P. Morgan Securities LLC and BofA Securities, Inc. are the representatives of the underwriters:

Name	Number of Shares
Goldman Sachs & Co. LLC	
J.P. Morgan Securities LLC	
BofA Securities, Inc.	
Cowen and Company, LLC	
Guggenheim Securities, LLC	
William Blair & Company, L.L.C.	
BTIG, LLC	
Total	

The underwriters are committed to take and pay for all of the shares being offered, if any are taken, other than the shares covered by the option described below unless and until this option is exercised.

The underwriters have an option to buy up to an additional shares from us to cover sales by the underwriters of a greater number of shares than the total number set forth in the table above. They may exercise that option for 30 days. If any shares are purchased pursuant to this option, the underwriters will severally purchase shares in approximately the same proportion as set forth in the table above.

The following table shows the per share and total underwriting discounts and commissions to be paid to the underwriters by us. Such amounts are shown assuming both no exercise and full exercise of the underwriters' option to purchase additional shares.

	No Exercise	Full Exercise
Per Share	$	$
Total		

Shares sold by the underwriters to the public will initially be offered at the initial public offering price set forth on the cover of this prospectus. Any shares sold by the underwriters to securities dealers may be sold at a discount of up to $ per share from the initial public offering price. After the initial offering of the shares of our common stock, the representatives may change the offering price and the other selling terms. The offering of the shares by the underwriters is subject to receipt and acceptance and subject to the underwriters' right to reject any order in whole or in part.

We and our officers, directors and holders of substantially all of our common stock and securities convertible into or exchangeable for our common stock have agreed with the underwriters, subject to certain exceptions, not to dispose of or hedge any of their common stock or securities convertible into or exchangeable for shares of our common stock during the period from the date of this prospectus continuing through the date 180 days after the date of this prospectus, except with the prior written consent of the representatives. This agreement does not apply to any existing employee benefit plans. See the "*Shares Eligible for Future Sale*" section of this prospectus for a discussion of certain transfer restrictions.

Prior to this offering, there has been no public market for shares of our common stock. The initial public offering price will be negotiated among us and the representatives. Among the factors we expect to consider in determining the initial public offering price of shares of our common stock, in addition to prevailing market conditions, will be our historical performance, estimates of the business potential and our earnings prospects, an assessment of our management and the consideration of the above factors in relation to market valuation of companies in related businesses.

We have applied to list our common stock on The Nasdaq Global Select Market under the symbol “ADPT.”

In connection with this offering, the underwriters may purchase and sell shares of our common stock in the open market. These transactions may include short sales, stabilizing transactions and purchases to cover positions created by short sales. Short sales involve the sale by the underwriters of a greater number of shares than they are required to purchase in the offering, and a short position represents the amount of such sales that have not been covered by subsequent purchases. A “covered short position” is a short position that is not greater than the amount of additional shares for which the underwriters’ option described above may be exercised. The underwriters may cover any covered short position by either exercising their option to purchase additional shares or purchasing shares in the open market. In determining the source of shares to cover the covered short position, the underwriters will consider, among other things, the price of shares available for purchase in the open market as compared to the price at which they may purchase additional shares pursuant to the option described above. “Naked” short sales are any short sales that create a short position greater than the amount of additional shares for which the option described above may be exercised. The underwriters must cover any such naked short position by purchasing shares in the open market. A naked short position is more likely to be created if the underwriters are concerned that there may be downward pressure on the price of the common stock in the open market after pricing that could adversely affect investors who purchase in the offering. Stabilizing transactions consist of various bids for or purchases of common stock made by the underwriters in the open market prior to the closing of the offering.

The underwriters may also impose a penalty bid. This occurs when a particular underwriter repays to the underwriters a portion of the underwriting discount received by it because the representatives have repurchased shares sold by or for the account of such underwriter in stabilizing or short covering transactions.

Purchases to cover a short position and stabilizing transactions, as well as other purchases by the underwriters for their own accounts, may have the effect of preventing or retarding a decline in the market price of our common stock, and together with the imposition of the penalty bid, may stabilize, maintain or otherwise affect the market price of our common stock. As a result, the price of our common stock may be higher than the price that otherwise might exist in the open market. The underwriters are not required to engage in these activities and may end any of these activities at any time. These transactions may be effected on The Nasdaq Global Select Market, in the over-the-counter market or otherwise.

We estimate that our share of the total expenses of this offering, excluding underwriting discounts and commissions, will be approximately $ million. We have agreed to reimburse the underwriters for certain of their expenses in an amount up to $.

We have agreed to indemnify the several underwriters against certain liabilities, including liabilities under the Securities Act.

The underwriters and their respective affiliates are full service financial institutions engaged in various activities, which may include sales and trading, commercial and investment banking, advisory,

investment management, investment research, principal investment, hedging, market making, brokerage and other financial and non-financial activities and services. Certain of the underwriters and their respective affiliates have provided, and may in the future provide, a variety of these services to the issuer and to persons and entities with relationships with the issuer, for which they received or will receive customary fees and expenses.

In the ordinary course of their various business activities, the underwriters and their respective affiliates, officers, directors and employees may purchase, sell or hold a broad array of investments and actively trade securities, derivatives, loans, commodities, currencies, credit default swaps and other financial instruments for their own account and for the accounts of their customers, and such investment and trading activities may involve or relate to assets, securities and instruments of the issuer (directly, as collateral securing other obligations or otherwise) and persons and entities with relationships with the issuer. The underwriters and their respective affiliates may also communicate independent investment recommendations, market color or trading ideas and publish or express independent research views in respect of such assets, securities or instruments and may at any time hold, or recommend to clients that they should acquire, long and short positions in such assets, securities and instruments.

European Economic Area

In relation to each Member State of the EEA which has implemented the Prospectus Directive (each, a "Relevant Member State") an offer to the public of our common stock may not be made in that Relevant Member State, except that an offer to the public in that Relevant Member State of our common stock may be made at any time under the following exemptions under the Prospectus Directive:

- To any legal entity which is a qualified investor as defined in the Prospectus Directive;
- To fewer than 150 natural or legal persons (other than qualified investors as defined in the Prospectus Directive), subject to obtaining the prior consent of the representatives for any such offer; or
- In any other circumstances falling within Article 3(2) of the Prospectus Directive;

provided that no such offer or shares of our common stock shall result in a requirement for the publication by us or any underwriter to publish a prospectus pursuant to Article 3 of the Prospectus Directive.

For the purposes of this provision, the expression an "offer to public" in relation to our common stock in any Relevant Member State means the communication in any form and by any means of sufficient information on the terms of the offer and our common stock to be offered so as to enable an investor to decide to purchase our common stock, as the same may be varied in that Relevant Member State by any measure implementing the Prospectus Directive in that Relevant Member State, and the expression "Prospectus Directive" means Directive 2003/71/EC (as amended), including by Directive 2010/73/EU and includes any relevant implementing measure in the Relevant Member State.

This EEA selling restriction is in addition to any other selling restrictions set out below.

United Kingdom

In the United Kingdom, this prospectus is only addressed to and directed at qualified investors who are (i) investment professionals falling within Article 19(5) of the Financial Services and Markets

Act 2000 (Financial Promotion) Order 2005 ("Order"); or (ii) high net worth entities and other persons to whom it may otherwise lawfully be communicated, falling within Article 49(2)(a) to (d) of the Order (all such persons together being referred to as "relevant persons"). Any investment or investment activity to which this prospectus relates is available only to relevant persons and will only be engaged in with relevant persons. Any person who is not a relevant person should not act or rely on this prospectus or any of its contents.

Canada

Shares of our common stock may be sold in Canada only to purchasers purchasing, or deemed to be purchasing, as principal that are accredited investors, as defined in National Instrument 45-106 Prospectus Exemptions or subsection 73.3(1) of the Securities Act (Ontario), and are permitted clients, as defined in National Instrument 31-103 Registration Requirements, Exemptions and Ongoing Registrant Obligations. Any resale of the shares must be made in accordance with an exemption form, or in a transaction not subject to, the prospectus requirements of applicable securities laws.

Securities legislation in certain provinces or territories of Canada may provide a purchaser with remedies for rescission or damages if this prospectus (including any amendment thereto) contains a misrepresentation, provided that the remedies for rescission or damages are exercised by the purchaser within the time limit prescribed by the securities legislation of the purchaser's province or territory. The purchaser should refer to any applicable provisions of the securities legislation of the purchaser's province or territory for particulars of these rights or consult with a legal advisor.

Pursuant to Section 3A.3 of National Instrument 33-105 Underwriting Conflicts (NI 33-105), the underwriters are not required to comply with the disclosure requirements of NI 33-105 regarding underwriter conflicts of interest in connection with this offering.

Hong Kong

Shares of our common stock may not be offered or sold in Hong Kong by means of any document other than (i) in circumstances which do not constitute an offer to the public within the meaning of the Companies (Winding Up and Miscellaneous Provisions) Ordinance (Cap. 32 of the Laws of Hong Kong) ("Companies (Winding Up and Miscellaneous Provisions) Ordinance"), or which do not constitute an invitation to the public within the meaning of the Securities and Futures Ordinance (Cap. 571 of the Laws of Hong Kong) ("Securities and Futures Ordinance"), or (ii) to "professional investors" as defined in the Securities and Futures Ordinance and any rules made thereunder, or (iii) in other circumstances which do not result in the document being a "prospectus" as defined in the Companies (Winding Up and Miscellaneous Provisions) Ordinance, and no advertisement, invitation or document relating to the shares may be issued or may be in the possession of any person for the purpose of issue (in each case whether in Hong Kong or elsewhere), which is directed at, or the contents of which are likely to be accessed or read by, the public in Hong Kong (except if permitted to do so under the securities laws of Hong Kong) other than with respect to shares which are or are intended to be disposed of only to persons outside Hong Kong or only to "professional investors" in Hong Kong as defined in the Securities and Futures Ordinance and any rules made thereunder.

Singapore

This prospectus has not been registered as a prospectus with the Monetary Authority of Singapore. Accordingly, this prospectus and any other document or material in connection with the offer or sale, or invitation for subscription or purchase, of shares of our common stock may not be

circulated or distributed, nor may the shares be offered or sold, or be made the subject of an invitation for subscription or purchase, whether directly or indirectly, to persons in Singapore other than (i) to an institutional investor (as defined under Section 4A of the Securities and Futures Act, Chapter 289 of Singapore ("SFA")) under Section 274 of the SFA, (ii) to a relevant person (as defined in Section 275(2) of the SFA) pursuant to Section 275(1) of the SFA, or any person pursuant to Section 275(1A) of the SFA, and in accordance with the conditions specified in Section 275 of the SFA or (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA, in each case subject to conditions set forth in the SFA.

Where shares of our common stock are subscribed or purchased under Section 275 of the SFA by a relevant person which is a corporation (which is not an accredited investor (as defined in Section 4A of the SFA)) the sole business of which is to hold investments and the entire share capital of which is owned by one or more individuals, each of whom is an accredited investor, the securities (as defined in Section 239(1) of the SFA) of that corporation shall not be transferable for six months after that corporation has acquired the shares under Section 275 of the SFA except: (1) to an institutional investor under Section 274 of the SFA or to a relevant person (as defined in Section 275(2) of the SFA), (2) where such transfer arises from an offer in that corporation's securities pursuant to Section 275(1A) of the SFA, (3) where no consideration is or will be given for the transfer, (4) where the transfer is by operation of law, (5) as specified in Section 276(7) of the SFA or (6) as specified in Regulation 32 of the Securities and Futures (Offers of Investments) (Shares and Debentures) Regulations 2005 of Singapore, ("Regulation 32").

Where shares of our common stock are subscribed or purchased under Section 275 of the SFA by a relevant person which is a trust (where the trustee is not an accredited investor (as defined in Section 4A of the SFA)) whose sole purpose is to hold investments and each beneficiary of the trust is an accredited investor, the beneficiaries' rights and interest (howsoever described) in that trust shall not be transferable for six months after that trust has acquired the shares under Section 275 of the SFA except: (1) to an institutional investor under Section 274 of the SFA or to a relevant person (as defined in Section 275(2) of the SFA), (2) where such transfer arises from an offer that is made on terms that such rights or interest are acquired at a consideration of not less than S$200,000 (or its equivalent in a foreign currency) for each transaction (whether such amount is to be paid for in cash or by exchange of securities or other assets), (3) where no consideration is or will be given for the transfer, (4) where the transfer is by operation of law, (5) as specified in Section 276(7) of the SFA or (6) as specified in Regulation 32.

Japan

Shares of our common stock have not been and will not be registered under the Financial Instruments and Exchange Act of Japan (Act No. 25 of 1948, as amended) ("FIEA"). The shares may not be offered or sold, directly or indirectly, in Japan or to or for the benefit of any resident of Japan (including any person resident in Japan or any corporation or other entity organized under the laws of Japan) or to others for reoffering or resale, directly or indirectly, in Japan or to or for the benefit of any resident of Japan, except pursuant to an exemption from the registration requirements of the FIEA and otherwise in compliance with any relevant laws and regulations of Japan.

LEGAL MATTERS

The validity of the shares of common stock offered by this prospectus will be passed upon for us by DLA Piper LLP (US), Seattle, Washington. As of the date of this prospectus, partners of DLA Piper LLP (US) beneficially own an aggregate of less than 0.5% of our common stock. Fenwick & West LLP, Seattle, Washington is acting as counsel for the underwriters in connection with this offering.

EXPERTS

Ernst & Young LLP, independent registered public accounting firm, has audited our financial statements at December 31, 2017 and 2018, and for each of the two years in the period ended December 31, 2018, as set forth in their report. We've included our audited financial statements in the prospectus and elsewhere in the registration statement in reliance of Ernst & Young LLP's report, given on their authority as experts in accounting and auditing.

ADDITIONAL INFORMATION

We have filed with the SEC this registration statement on Form S-1 under the Securities Act with respect to the securities offered by this prospectus. This prospectus, which is a part of the registration statement, does not contain all of the information in the registration statement and the exhibits filed with the registration statement. For further information concerning us and the securities offered by this prospectus, please refer to the registration statement and to the exhibits filed therewith. Statements contained in this prospectus regarding the contents of any contract or other document that is filed as an exhibit to the registration statement are not necessarily complete, and each such statement is qualified in all respects by reference to the full text of such contract or other document filed as an exhibit to the registration statement.

Upon the closing of this offering, we will be subject to the informational requirements of the Exchange Act and will file annual, quarterly and current reports, proxy statements and other information with the SEC. You can read our SEC filings, including the registration statement, at the SEC's website at www.sec.gov. We also maintain a website at www.adaptivebiotech.com. Upon the closing of this offering, you may access, free of charge, our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after such material is electronically filed with, or furnished to, the SEC.

ADAPTIVE BIOTECHNOLOGIES CORPORATION

INDEX TO AUDITED FINANCIAL STATEMENTS

For the Years Ended December 31, 2017 and 2018

INDEX TO UNAUDITED CONDENSED FINANCIAL STATEMENTS

For the Three Months Ended March 31, 2018 and 2019

Report of Independent Registered Public Accounting Firm

To the Shareholders and the Board of Directors of
Adaptive Biotechnologies Corporation

Opinion on the Financial Statements

We have audited the accompanying balance sheets of Adaptive Biotechnologies Corporation (the "Company") as of December 31, 2017 and 2018, the related statements of operations, comprehensive loss, convertible preferred stock and shareholders' (deficit) equity, and cash flows, for the years then ended, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2017 and 2018, and the results of its operations and its cash flows for the years then ended in conformity with U.S. generally accepted accounting principles.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 2015.

Seattle, Washington
March 29, 2019

Adaptive Biotechnologies Corporation
Balance Sheets

(in thousands, except share and per share amounts)

	December 31, 2017	December 31, 2018
Assets		
Current assets		
Cash and cash equivalents	$ 85,305	$ 55,030
Short-term marketable securities	106,845	109,988
Accounts receivable, net	5,582	4,807
Inventory	4,792	7,838
Prepaid expenses and other current assets	2,723	3,055
Total current assets	205,247	180,718
Long-term assets		
Property and equipment, net	13,954	19,125
Long-term marketable securities	8,905	—
Restricted cash and other assets	86	247
Intangible assets, net	15,325	13,626
Goodwill	118,972	118,972
Total assets	$ 362,489	$ 332,688
Liabilities, convertible preferred stock and shareholders' (deficit) equity		
Current liabilities		
Accounts payable	$ 1,964	$ 1,793
Accrued liabilities	1,043	2,562
Accrued compensation and benefits	3,062	4,641
Current portion of deferred rent	886	1,109
Current deferred revenue	14,048	12,695
Total current liabilities	21,003	22,800
Long-term liabilities		
Convertible preferred stock warrant liability	342	336
Deferred rent liability, less current portion	4,394	6,102
Deferred revenue, less current portion	—	704
Other long-term liabilities	33	—
Total liabilities	25,772	29,942
Commitments and contingencies (Note 10)		
Convertible preferred stock: $0.0001 par value, 93,762,517 shares authorized at December 31, 2017 and December 31, 2018, respectively; 92,656,029 and 92,790,094 shares issued and outstanding at December 31, 2017 and 2018, respectively; aggregate liquidation preference of $572,057 and $572,866 at December 31, 2017 and December 31, 2018, respectively	561,333	560,858
Shareholders' (deficit) equity		
Common stock: $0.0001 par value, 131,000,000 shares authorized at December 31, 2017 and 2018, respectively; 12,208,731 and 12,841,536 shares issued and outstanding at December 31, 2017 and 2018, respectively	1	1
Additional paid-in capital	24,972	37,902
Accumulated other comprehensive loss	(166)	(107)
Accumulated deficit	(249,423)	(295,908)
Total shareholders' (deficit) equity	(224,616)	(258,112)
Total liabilities, convertible preferred stock and shareholders' (deficit) equity	$ 362,489	$ 332,688

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Statements of Operations

(in thousands, except share and per share amounts)

	Year Ended December 31,	
	2017	2018
Revenue		
Sequencing revenue	$ 22,759	$ 32,978
Development revenue	15,689	22,685
Total revenue	38,448	55,663
Operating expenses		
Cost of revenue	15,680	19,668
Research and development	31,995	39,157
Sales and marketing	16,765	24,486
General and administrative	15,949	20,409
Amortization of intangible assets	1,694	1,699
Restructuring	840	—
Total operating expenses	82,923	105,419
Loss from operations	(44,475)	(49,756)
Interest and other income, net	1,644	3,309
Net loss	(42,831)	(46,447)
Fair value adjustment to Series E-1 convertible preferred stock options	135	102
Net loss attributable to common shareholders	$ (42,696)	$ (46,345)
Net loss per share attributable to common shareholders, basic and diluted	$ (3.50)	$ (3.67)
Weighted-average shares used in computing net loss per share attributable to common shareholders, basic and diluted	12,196,998	12,629,778
Unaudited pro forma net loss per share attributable to common shareholders, basic and diluted		$ (0.44)
Unaudited weighted-average shares used in computing pro forma net loss per share attributable to common shareholders, basic and diluted		105,433,645

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Statements of Comprehensive Loss

(in thousands)

	Year Ended December 31,	
	2017	2018
Net loss	$ (42,831)	$ (46,447)
Change in unrealized (loss) gain on investments	(84)	59
Comprehensive loss	$ (42,915)	$ (46,388)

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Statements of Convertible Preferred Stock and Shareholders' (Deficit) Equity
(in thousands, except share amounts)

	Convertible preferred stock		Common stock		Additional paid-In capital	Accumulated other comprehensive (loss) income	Accumulated deficit	Total shareholders' (deficit) equity
	Shares	Amount	Shares	Amount				
Balance as of December 31, 2016	87,797,854	$511,823	12,154,046	$ 1	$ 17,559	$ (82)	$ (207,212)	$ (189,734)
Adjustments to accumulated deficit for adoption of guidance on accounting for revenue recognition	—	—	—	—	—	—	485	485
Issuance of common stock for cash upon exercise of stock options	—	—	54,685	—	95	—	—	95
Issuance of Series F-1 convertible preferred stock for cash, net of issuance costs	4,686,649	49,827	—	—	—	—	—	—
Issuance of Series E-1 convertible preferred stock for cash upon exercise of Series E-1 convertible preferred stock options at fair value	171,526	127	—	—	—	—	—	—
Vested Series E-1 convertible preferred stock option forfeitures	—	(644)	—	—	398	—	246	644
Series E-1 convertible preferred stock option share-based compensation	—	—	—	—	89	—	—	89
Adjustment to redemption value for vested Series E-1 convertible preferred stock options	—	89	—	—	(89)	—	—	(89)
Change in redemption value for vested Series E-1 convertible preferred stock options	—	111	—	—	—	—	(111)	(111)
Common stock option share-based compensation	—	—	—	—	6,920	—	—	6,920
Other comprehensive loss	—	—	—	—	—	(84)	—	(84)
Net loss	—	—	—	—	—	—	(42,831)	(42,831)
Balance as of December 31, 2017	92,656,029	$561,333	12,208,731	$ 1	$ 24,972	$ (166)	$ (249,423)	$ (224,616)
Adjustments to accumulated deficit for adoption of guidance on accounting for share-based payment transactions	—	—	—	—	140	—	(140)	—
Issuance of common stock for cash upon exercise of stock options	—	—	632,805	—	1,168	—	—	1,168
Issuance of Series E-1 convertible preferred stock for cash upon exercise of Series E-1 convertible preferred stock options at fair value	134,065	100	—	—	—	—	—	—
Vested Series E-1 convertible preferred stock option forfeitures	—	(767)	—	—	476	—	291	767
Series E-1 convertible preferred stock option share-based compensation	—	—	—	—	3	—	—	3
Adjustment to redemption value for vested Series E-1 convertible preferred stock options	—	3	—	—	(3)	—	—	(3)
Change in redemption value for vested Series E-1 convertible preferred stock options	—	189	—	—	—	—	(189)	(189)
Common stock option share-based compensation	—	—	—	—	11,146	—	—	11,146
Other comprehensive gain	—	—	—	—	—	59	—	59
Net loss	—	—	—	—	—	—	(46,447)	(46,447)
Balance as of December 31, 2018	92,790,094	$560,858	12,841,536	$ 1	$ 37,902	$ (107)	$ (295,908)	$ (258,112)

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Statements of Cash Flows

(in thousands)

	Year Ended December 31, 2017	2018
Operating activities		
Net loss	$ (42,831)	$ (46,447)
Adjustments to reconcile net loss to net cash (used in) provided by operating activities:		
Depreciation expense	4,102	4,301
Share-based compensation expense	7,009	11,149
Intangible assets amortization	1,694	1,699
Investment amortization	342	(1,214)
Asset impairment	193	17
Loss (gain) on equipment disposals	125	(40)
Fair value adjustment of convertible preferred stock warrant	(23)	(6)
Other	6	5
Changes in operating assets and liabilities:		
Accounts receivable, net	(2,427)	775
Inventory	(2,697)	(3,046)
Prepaid expenses and other current assets	(327)	(318)
Accounts payable and accrued liabilities	(1,517)	2,185
Deferred rent	(1,058)	(488)
Deferred revenue	2,527	(649)
Other	24	(182)
Net cash used in operating activities	(34,858)	(32,259)
Investing activities		
Purchases of property and equipment	(2,421)	(6,318)
Proceeds from sales of equipment	207	19
Purchases of intangible assets	(85)	—
Purchases of marketable securities	(125,182)	(146,503)
Proceeds from sales and maturities of marketable securities	163,913	153,538
Net cash provided by investing activities	36,432	736
Financing activities		
Proceeds from issuance of convertible preferred stock, net of issuance costs	49,827	—
Proceeds from exercise of stock options	222	1,268
Other	(15)	(20)
Net cash provided by financing activities	50,034	1,248
Net increase (decrease) in cash, cash equivalents and restricted cash	51,608	(30,275)
Cash, cash equivalents and restricted cash at beginning of year	33,758	85,366
Cash, cash equivalents and restricted cash at end of year	$ 85,366	$ 55,091
Non-cash investing and financing activities		
Purchases of equipment, included in accounts payable and accrued liabilities	$ 41	$ 832
Landlord-funded leasehold improvements	$ —	$ 2,419

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Notes to Financial Statements

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1. Organization and Description of Business

Adaptive Biotechnologies Corporation ("we," "us" or "our") is advancing the field of immune-driven medicine by harnessing the inherent biology of the adaptive immune system to transform the diagnosis and treatment of disease. We believe the adaptive immune system is nature's most finely tuned diagnostic and therapeutic for most diseases, but the inability to decode it has prevented the medical community from fully leveraging its capabilities. Our immune medicine platform is the foundation for our expanding suite of products and services. The cornerstone of our immune medicine platform and core immunosequencing product, immunoSEQ, serves as our underlying research and development engine and generates revenue from academic and biopharmaceutical customers. Our first clinical diagnostic product, clonoSEQ, is the first test authorized by the FDA for the detection and monitoring of minimal residual disease ("MRD") in patients with select blood cancers.

We were incorporated in the State of Washington on September 8, 2009 under the name Adaptive TCR Corporation. On December 21, 2011, we changed our name to Adaptive Biotechnologies Corporation. We are headquartered in Seattle, Washington.

2. Significant Accounting Policies

Basis of Presentation and Use of Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles ("U.S. GAAP") requires management to make certain estimates, judgments and assumptions that affect the reported amounts of assets and liabilities and the related disclosures at the date of the financial statements, as well as the reported amounts of revenues and expenses during the periods presented. We base our estimates on historical experience and other relevant assumptions that we believe to be reasonable under the circumstances. Estimates are used in several areas including, but not limited to, estimates of progress to date for certain performance obligations and transaction price for certain contracts with customers, share-based compensation including the fair value of stock, the provision for income taxes including related reserves, and goodwill among others. These estimates generally involve complex issues and require judgments, involve the analysis of historical results and prediction of future trends, can require extended periods of time to resolve and are subject to change from period to period. Actual results may differ materially from management's estimates.

Cash and Cash Equivalents

Cash and cash equivalents are stated at fair value. Cash equivalents include only securities having an original maturity of three months or less at the time of purchase. We limit our credit risk associated with cash and cash equivalents by placing our investments with banks that we believe are highly creditworthy and with highly rated money market funds. Cash and cash equivalents primarily consist of bank deposits, investments in money market funds and commercial paper.

Restricted Cash

We are required to maintain certain balances under operating lease arrangements for our facilities. We have a certificate of deposit with a financial institution issued in favor of the lessor for $0.1 million as of December 31, 2017 and 2018. This amount is recorded as restricted cash and other assets in the accompanying balance sheets due to the long-term nature of the underlying facility lease.

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Investments in Marketable Securities

Marketable securities are classified as available-for-sale and primarily consist of U.S. government debt securities, U.S. government agency bonds, commercial paper and corporate bonds, and are reported at fair value. Unrealized holding gains and losses are reflected as a separate component of shareholders' (deficit) equity in accumulated other comprehensive loss until realized. Realized gains and losses on the sale of these securities are recognized in net income or loss. The cost of marketable securities sold is based on the specific identification method.

Concentrations of Risk

We are subject to a concentration of risk from a limited number of suppliers, or in some cases, single suppliers for some of our laboratory instruments and materials. This risk is managed by targeting a quantity of surplus stock.

Cash, cash equivalents and marketable securities are financial instruments that potentially subject us to concentrations of credit risk. We invest in money market funds, U.S. government debt securities, U.S. government agency bonds, commercial paper and corporate bonds with high-quality accredited financial institutions.

Significant customers are those which represent more than 10% of our total revenue or accounts receivable balance at each respective balance sheet date. Revenue from these customers reflects their purchase of our products and services and we do not believe their loss would have a material adverse effect on our business. For each significant customer, revenue as a percentage of revenue and accounts receivable as a percentage of accounts receivable were as follows:

	Revenue		Accounts Receivable	
	Year Ended December 31,		December 31,	
	2017	2018	2017	2018
Customer A	31.4%	18.4%	29.9%	*%
Customer B	*	13.5	14.9	15.1
Customer C	*	15.4	*	13.2

* less than 10%

Accounts Receivable

Accounts receivable consist of amounts due from customers for services performed. We review our accounts receivable regularly by analyzing the status of significant past due receivables to determine if any receivable will potentially be uncollectible and to estimate the amount of allowance for doubtful accounts necessary to reduce accounts receivable to its estimated net realizable value. Our allowance for doubtful accounts was $0.1 million as of December 31, 2017 and 2018.

Additionally, we had $1.4 million and $0.4 million of unbilled receivables as of December 31, 2017 and 2018, respectively. The unbilled receivables are amounts that will become due for which we have an unconditional right to consideration.

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Inventory

Inventory consists of laboratory materials and supplies used in lab analysis. We capitalize inventory when purchased and record expense upon order fulfillment for servicing revenue or utilization in our research and development laboratories. Inventory is valued at the lower of cost or market on a first-in, first-out basis. We periodically perform obsolescence assessments and write off any inventory that is no longer usable.

Property and Equipment

Property and equipment consist of computer equipment, computer software, laboratory equipment, leasehold improvements and furniture and fixtures. Property and equipment are recorded at cost and depreciation is recognized using the straight-line method based on an estimated useful life. Maintenance and repairs are charged to expense as incurred, and costs of improvements are capitalized.

Useful lives assigned to property and equipment are as follows:

Laboratory equipment	3 to 7 years
Leasehold improvements	Shorter of estimated useful life or remaining lease term
Computer equipment and software	3 years
Furniture and office equipment	5 to 10 years

We review long-lived assets for impairment whenever events or circumstances indicate the carrying amount of an asset group may not be recoverable. Gains and losses from asset disposals and impairment losses are classified within the statements of operations in accordance with the use of the asset, except those gains and losses recognized in conjunction with restructuring activities, which are classified within restructuring expense. We recognized $0.3 million of impairment expense in research and development for obsolete equipment in 2017 and $0.2 million of losses from asset disposals, impairment and accelerated depreciation in restructuring. See Note 14, *Restructuring Charges*.

Goodwill

Goodwill represents the excess of the purchase price over the net amount of identifiable assets acquired and liabilities assumed in a business combination measured at fair value. We assess goodwill for impairment annually on October 1, or more frequently if events or changes in circumstances would more likely than not reduce the fair value of our single reporting unit below its carrying value. We evaluate goodwill for impairment by first assessing qualitative factors to determine whether it is more likely than not that the fair value of our reporting unit is less than its carrying amount. If we so determine, or if we choose to bypass the qualitative assessment, we perform a quantitative goodwill impairment test. Goodwill impairment exists when the estimated fair value of our one reporting unit is less than its carrying value. If impairment exists, the carrying value of the goodwill is reduced to fair value through an impairment charge recorded in our statements of operations. To date we have not recognized any impairment of goodwill.

Intangible Assets

Intangible assets acquired in a business combination are recognized separately from goodwill and are initially recognized at their fair value at the acquisition date (which is regarded as their cost).

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Intangible assets may also result from the purchase of assets and intellectual property in a transaction that does not qualify as a business combination. Intangible assets are amortized over the estimated useful life of the asset on a straight-line basis which approximates the usage pattern. Intangible assets are reviewed for impairment at least annually or if indicators of potential impairment exist. We have not recognized any impairment losses on intangible assets.

Restructuring

We recognize a liability for costs associated with an exit or disposal activity under a restructuring project when the plan has been finalized. Employee termination benefits considered as post-employment benefits are accrued when the obligation is probable and estimable, such as benefits stipulated by human resource policies and practices or statutory requirements. One-time termination benefits are recognized at the date the employee is notified. If the employee must provide future service greater than 60 days, such benefits are recognized ratably over the future service period.

Asset impairments associated with a restructuring project are determined at the asset group level. An impairment may be recognized for assets that are to be abandoned or are to be sold for less than net book value. We may also recognize impairment on an asset group, which is held and used, when the carrying value is not recoverable and exceeds the asset group's fair value. If the sale of an asset group under a restructuring project results in proceeds that exceed the net book value of the asset group, the resulting gain is recognized within restructuring expense in the statements of operations.

Leases

We have lease agreements for our laboratory and office facilities. These leases are classified as operating leases. Rent expense is recognized on a straight-line basis over the term of the lease. Incentives granted under our facility leases, including rent holidays, are capitalized and are recognized as adjustments to rental expense on a straight-line basis over the term of the lease.

Fair Value of Financial Instruments

The Financial Accounting Standards Board ("FASB") has defined fair value as the exchange price that would be received for an asset or paid to transfer a liability, or an exit price, in the principal or most advantageous market for that asset or liability in an orderly transaction between market participants on the measurement date. The FASB established a fair value hierarchy that requires an entity to maximize the use of observable inputs, where available, and minimize the use of unobservable inputs when measuring fair value. The hierarchy defines three levels of inputs that may be used to measure fair value:

- *Level 1:* Quoted prices in active markets for identical assets or liabilities.
- *Level 2:* Observable inputs other than Level 1 prices, such as quoted prices for similar assets or liabilities, quoted prices in markets that are not active, or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities.
- *Level 3:* Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities.

A financial instrument categorization within the valuation hierarchy is based upon the lowest level of input that is significant to the fair value measurement.

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Our financial instruments consist of Level 1 and Level 2 assets, and Level 3 liabilities. In certain cases, where there is limited activity or less transparency around inputs to valuation, financial instruments are classified as Level 3 within the valuation hierarchy. The carrying amounts of certain financial instruments approximate fair value due to their short maturities.

We did not have any nonfinancial assets or liabilities that were measured or disclosed at fair value on a recurring basis as of December 31, 2017 or 2018.

Convertible Preferred Stock Warrant Liability

We have issued a freestanding warrant to a venture capital firm to purchase 56,875 shares of Series C convertible preferred stock with an exercise price of $2.64 in connection with a $5.0 million credit facility entered into in 2014. The fair value of this warrant is classified as a non-current liability in the accompanying balance sheets, since the underlying convertible preferred stock has been classified as temporary equity in the accompanying balance sheets instead of in shareholders' deficit in accordance with authoritative guidance for the classification and measurement of potentially redeemable securities. Upon certain change in control events that are outside of our control, including liquidation, sale or transfer of control, holders of the convertible preferred stock may cause its redemption. The warrant is subject to remeasurement at each balance sheet date, with changes in estimated fair value recognized as a component of interest and other income, net on the statements of operations. We recorded income of $23,000 and $6,000 during the years ended December 31, 2017 and 2018, respectively. We will continue to adjust the liability for changes in estimated fair value until the earlier of expiration of the warrant, exercise of the warrant or conversion of the warrant into equity upon the completion of a liquidation event, including the completion of an initial public offering.

Revenue Recognition

We recognize revenue in accordance with Accounting Standards Codification ("ASC") Topic 606 ("ASC 606"), *Revenue from Contracts with Customers.* Under ASC 606, for all revenue-generating contracts, we perform the following steps to determine the amount of revenue to be recognized: (i) identification of the contract or contracts; (ii) determination of whether the promised goods or services are performance obligations, including whether they are distinct in the context of the contract; (iii) measurement of the transaction price, including the constraint on variable consideration; (iv) allocation of the transaction price to the performance obligations based on estimated selling prices; and (v) recognition of revenue when (or as) we satisfy each performance obligation. The following is a summary of the application of the respective model to each of our revenue classifications.

Overview

Our revenue is generated from immunosequencing ("sequencing") products and services ("sequencing revenue") and from regulatory or development support services leveraging our immune medicine platform ("development revenue"). When revenue generating contracts have elements of both sequencing revenue and development revenue, we allocate revenue based on the nature of the performance obligation and the allocated transaction price.

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Sequencing Revenue

Sequencing revenue reflects the amounts generated from providing sequencing services through immunoSEQ to research customers and from providing testing services through clonoSEQ to clinical and research customers.

For research customers, contracts typically include an amount billed in advance of services ("upfront"), and subsequent billings as sample results are delivered to the customer. Upfront amounts received are recorded as deferred revenue, which we recognize as revenue upon satisfaction of performance obligations. We have identified two typical performance obligations under the terms of our research service contracts: sequencing services and related data analysis. We recognize revenue for both identified performance obligations as sample results are delivered to the customer.

For other research customers who choose to purchase a research use only kit, the kits are sold on a price per kit basis with amounts payable upon delivery of the kit. Payments received are recorded as deferred revenue. For these customers we have identified one performance obligation: the delivery of sample results. We recognize revenue as the results are delivered to the customer based on a proportion of the estimated samples that can be reported on for each kit.

For clinical customers, we derive revenues from providing our clonoSEQ test report to ordering physicians, and we bill and receive payments from commercial third-party payors and medical institutions. In these transactions, we have identified one performance obligation: the delivery of a clonoSEQ report. As payment from the respective payors may vary based on the various reimbursement rates and patient responsibilities, we consider the transaction price to be variable and record an estimate of the transaction price, subject to the constraint for variable consideration, as revenue at the time of delivery. The estimate of transaction price is based on historical reimbursement rates with the various payors, which are monitored in subsequent periods and adjusted as necessary based on actual collection experience.

Development Revenue

We derive revenue by providing services through development agreements to biopharmaceutical customers who seek access to our immune medicine platform technologies. We generate revenues from the delivery of professional support activities pertaining to the use of our proprietary immunoSEQ and clonoSEQ services in the development of the respective customers' initiatives. The transaction price for these contracts may consist of a combination of non-refundable upfront fees, separately priced sequencing fees, progress based milestones and regulatory milestones. The development agreements may include single or multiple performance obligations depending on the contract. For certain contracts, we may perform services to support the biopharmaceutical customers' regulatory submission as part of their registrational trials. These services include regulatory support pertaining to our technology intended to be utilized as part of the submission, development of analytical plans for our sequencing data, participation on joint research committees and assistance in completing a regulatory submission. Generally, these services are not distinct within the context of the contract, and they are accounted for as a single performance obligation.

When sequencing services are separately priced customer options, we assess if a material right exists and, if not, the customer option to purchase additional sequencing services is not considered part of the contract. Except for any non-refundable upfront fees, the other forms of compensation

represent variable consideration. Variable consideration related to progress based and regulatory milestones is estimated using the most likely amount method where variable consideration is constrained until it is probable that a significant reversal of cumulative revenue recognized will not occur. Progress milestones such as first sample result delivered or final patient enrollment in a customer trial are customer dependent and are included in the transaction price when the respective milestone is probable of occurring. Milestone payments that are not within our customers' control, such as regulatory approvals, are not considered probable of being achieved until those approvals are received. Determining whether milestones are probable, relating to regulatory milestone payments, is an area that requires significant judgment. In making this assessment, we evaluate the scientific, clinical, regulatory and other risks that must be managed, as well as the level of effort and investment required to achieve the respective milestone.

The primary method used to estimate standalone selling price for performance obligations is the adjusted market assessment approach. Using this approach, we evaluate the market in which we sell our services and estimate the price that a customer in that market would be willing to pay for our services. We recognize revenue using either an input or output measure of progress that faithfully depicts performance on a contract, depending on the contract. The measure used is dependent on the nature of the service to be provided in each contract. Selecting the measure of progress and estimating progress to date requires significant judgment.

Contract Balances

In certain circumstances, billing may occur prior to services being performed. Upfront payments are recorded as deferred revenue (contract liabilities). We classify deferred revenue as current for sequencing revenue as we expect our performance obligations will be completed within the next twelve months, however, we do not control the timing of customer provided samples. For development services, we assess the performance obligations and recognize deferred revenue as current or non-current based upon forecasted delivery times which are customer coordinated. In certain circumstances, the customer project may be cancelled or terminated prior to the delivery of all related services covered by a customer's upfront payment. In these circumstances, we recognize revenue when sufficient evidence is obtained that a reversal of revenue is not probable.

Share-Based Compensation

Share-based compensation includes compensation expense for stock option grants to employees and non-employees. Share-based compensation expense for employees represents grant date fair value of employee share option grants and is recognized over the requisite service period of the awards (usually the vesting period) on a straight-line basis, net of actual forfeitures. Share-based compensation to non-employees is subject to periodic revaluation over their vesting terms. We estimate the fair value of stock option grants using the Black-Scholes option-pricing model.

Cost of Revenue

Cost of revenue includes the cost of materials, personnel-related expenses (comprised of salaries, benefits and share-based compensation), shipping and handling, equipment and allocated facility costs associated with processing samples and professional support for our sequencing revenue. Allocated facility costs include depreciation of laboratory equipment, allocated facility occupancy and information technology costs. Costs associated with processing samples are recorded as expense, regardless of the timing of revenue recognition.

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Research and Development Expenses

Research and development expenses are comprised of laboratory materials costs, personnel-related expenses, allocated facility costs, information technology and contract service expenses. Research and development costs are expensed as incurred. Upfront payments for goods or services that will be used or rendered for future research and development activities are deferred and capitalized, then are recognized as an expense as the goods are consumed or the related services are performed.

Sales and Marketing Expenses

Sales and marketing expenses consist primarily of personnel-related expenses for commercial sales, account management, marketing, reimbursement, medical education and business development personnel that support commercialization of our platform products. In addition, these expenses include external costs such as advertising expenses, customer education and promotional expenses, market analysis expenses, conference fees, travel expenses and allocated facility costs.

Income Taxes

Income taxes are accounted for under the liability method. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to the differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases, and the operating loss and tax credit carryforwards. Valuation allowances are established when necessary to reduce deferred tax assets to the amount expected to be realized.

Deferred tax assets and liabilities are measured at the balance sheet date using the enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities due to a change in tax rates is recognized in the period such tax rate changes are enacted. Our net deferred tax assets are fully offset by a valuation allowance, because of our history of losses.

We recognize interest and penalties related to income tax matters as a component of tax expense. We did not record any interest or penalties related to income tax during the years ended December 31, 2017 and 2018.

Net Loss Per Share Attributable to Common Shareholders

We calculate our basic and diluted net loss per share attributable to common shareholders in conformity with the two-class method required for companies with participating securities. We consider our convertible preferred stock to be participating securities. In the event a dividend is declared or paid on common stock, holders of convertible preferred stock are entitled to a share of such dividend in proportion to the holders of common stock on an as-if converted basis. Under the two-class method, basic net loss per share attributable to common shareholders is calculated by dividing the net loss attributable to common shareholders by the weighted-average number of shares of common stock outstanding for the period. Net loss attributable to common shareholders is determined by allocating undistributed earnings between common and preferred shareholders. The diluted net loss per share attributable to common shareholders is computed by giving effect to all potential dilutive common stock equivalents outstanding for the period determined using the treasury stock method. The net loss

attributable to common shareholders was not allocated to the convertible preferred stock under the two-class method as the convertible preferred stock does not have a contractual obligation to share in our losses. For purposes of this calculation, convertible preferred stock, common stock warrants and stock options are considered common stock equivalents but have been excluded from the calculation of diluted net loss per share attributable to common shareholders as their effect is anti-dilutive.

Unaudited Pro Forma Net Loss Per Share Attributable to Common Shareholders

We have presented the unaudited pro forma basic and diluted net loss per share attributable to common shareholders for the year ended December 31, 2018, which shows the assumed effect of an initial public offering, including (i) the conversion of all convertible preferred stock into shares of common stock as if the conversion had occurred as of the later of the beginning of the period or the original date of issuance; and (ii) the issuance of 20,000 shares of common stock upon the assumed exercise of a common stock warrant prior to the completion of an initial public offering. The pro forma net loss per share attributable to common shareholders does not include proceeds to be received from nor does it include shares expected to be sold in the assumed initial public offering.

Segment Information

We have determined that our chief executive officer is the chief operating decision maker ("CODM"). The CODM reviews financial information presented on a regular basis at the entity level. Resource allocation decisions are made by the CODM based on the results at the entity level which is determined to be a single reporting unit. There are no segment managers who are held accountable by the CODM for operations, operating results or planning for levels or components below the entity. As such, we have concluded that we operate as one segment. We present disaggregated revenue from contracts with customers by type of service. See Note 3, *Revenue*.

Recent Accounting Pronouncements

In May 2014, the FASB issued Accounting Standards Update ("ASU") No. 2014-09, *Revenue from Contracts with Customers* (Topic 606), and created ASC 606, and added ASC Subtopic 340-40, *Other Assets and Deferred Costs—Contracts with Customers*. The guidance in this update supersedes the revenue recognition requirements in ASC Topic 605, *Revenue Recognition*, and most industry-specific guidance. We adopted this standard on January 1, 2017, applying the modified retrospective method to all contracts that were not completed as of January 1, 2017. We recorded an increase in accounts receivable of $0.4 million and a decrease in deferred revenue of $0.1 million as of January 1, 2017, with a corresponding adjustment to accumulated deficit. The impact of this adoption was primarily related to our clinical customers. Prior to adoption, we recognized revenue for these customers on a cash basis. Upon adoption, we recognize revenue at time of delivery using an estimate of the transaction price subject to the constraint for variable consideration.

In February 2016, the FASB issued ASU No. 2016-02, *Leases* (Topic 842), to increase transparency and comparability among organizations by recognizing lease assets and lease liabilities on the balance sheets and disclosing key information about leasing arrangements using a modified retrospective approach. This guidance is effective for us in fiscal years, and interim periods within those fiscal years, beginning after December 15, 2019. Although we are currently evaluating the impact that adopting this guidance will have on our financial statements, we currently believe the most significant changes will be related to the recognition of the right-of-use assets and related lease liabilities related to our operating leases on the balance sheets.

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In March 2016, the FASB issued ASU No. 2016-09, *Compensation—Stock Compensation* (Topic 718), intended to simplify the accounting for share-based payment transactions, including the income tax consequences, classification of awards as either equity or liabilities, classification on the statements of cash flows, including allowing an entity-wide accounting policy election to either estimate the number of awards that are expected to vest or account for forfeitures as they occur. We adopted this standard as of January 1, 2018 and elected to account for forfeitures as they occur. We utilized a modified retrospective transition method, recorded the cumulative impact of applying this standard, and recognized a cumulative increase to additional paid-in capital and an increase to accumulated deficit of $0.1 million.

In January 2017, the FASB issued ASU No. 2017-04, *Intangibles—Goodwill and Other* (Topic 350): *Simplifying the Test for Goodwill Impairment*, to simplify the goodwill impairment test. Under the new guidance, goodwill impairment will be measured by the amount by which the carrying value of a reporting unit exceeds its fair value, without exceeding the carrying amount of goodwill allocated to that reporting unit. This guidance is effective January 1, 2022 and is required to be adopted on a prospective basis, with early adoption permitted. We adopted this standard as of January 1, 2018 and this guidance did not have any impact on our financial statements.

In August 2018, the FASB issued ASU No. 2018-15, *Intangibles—Goodwill and Other: Internal-Use Software* (Subtopic 350-40), to provide additional guidance on the accounting for costs of implementation activities performed in a cloud computing arrangement. This guidance is effective for fiscal years beginning after December 15, 2019 and early adoption of the amendments in this update are permitted. The adoption of this guidance is not expected to have a material impact on our financial statements.

3. Revenue

We disaggregate our revenue from contracts with customers by type of service, as we believe this best depicts how the nature, amount, timing, and uncertainty of our revenue and cash flows are affected by economic factors. The following table presents our revenue disaggregated by type of products and services (in thousands):

	December 31,	
	2017	2018
Sequencing revenue	$22,759	$32,978
Development revenue:		
Development support	15,689	12,685
Regulatory milestones	—	10,000
Total development revenue	15,689	22,685
Total revenue	$38,448	$55,663

Translational Development Agreements

On December 18, 2015, we entered into a translational development agreement with a biopharmaceutical customer for access to certain of our oncology immunosequencing research datasets, including full-time employee support, to accelerate the customers preclinical, nonclinical and clinical trial testing. Under the terms of the agreement we could be entitled to up to $40.0 million over a period of four years which does not include any separately negotiated research sequencing contracts. If the biopharmaceutical customer terminates the agreement prior to the end of the initial four-year

research term for any reason other than a material uncured breach by us, then the biopharmaceutical partner has agreed to pay us $0.8 million.

We identified one performance obligation under this agreement, as the services were determined to be highly interrelated. We determined that any separately negotiated sequencing contracts are not performance obligations under the contract as the contract did not contain any material rights related to such sequencing contracts. For the identified performance obligation, we assessed the work to be performed over the duration of the contract and determined that it is a consistent level of support throughout the period, therefore revenue has been recognized straight line over the contract term.

Revenue recognized from this translational development agreement, excluding separately negotiated research sequencing contracts, was $10.0 million and $9.3 million for the years ended December 31, 2017 and 2018, respectively.

In 2017, we entered into an agreement with a customer to provide services to accelerate their research initiatives. We identified one performance obligation under the agreement, as the services were determined to be highly interrelated. We determined that any separately negotiated sequencing contracts are not performance obligations under the contract, as the contract did not contain any material rights related to such sequencing contracts. Revenue recognized from this agreement, excluding sequencing revenue, was $0.6 million for each of the years ended December 31, 2017 and 2018.

MRD Development Agreements

In 2017 and 2018, we entered into agreements with biopharmaceutical customers to further develop and commercialize clonoSEQ and the biopharmaceutical customers' therapeutics. Under each of the agreements, we received or will receive non-refundable upfront payments and could receive substantial additional payments upon reaching certain progress milestones or achievement of certain regulatory milestones pertaining to the customers' therapeutic and our clonoSEQ test.

Under the contracts, we identify performance obligations, which may include: (i) obligations to provide services supporting the customer's regulatory submission activities as they relate to our clonoSEQ test; and (ii) sequencing services for customer-provided samples for their regulatory submissions. The transaction price allocated to the respective performance obligations is estimated using an adjusted market assessment approach for the regulatory support services and a standalone selling price for the estimated immunosequencing services. At contract inception we fully constrained any consideration related to the regulatory milestones, as the achievement of such milestones is subject to third-party regulatory approval and the customers' own submission decision-making. We recognize revenue relating to the sequencing services over time using an output method based on the proportion of sample results delivered relative to the total amount of sample results expected to be delivered and when expected to be a faithful depiction of progress. We use the same method to recognize the regulatory support services. When an output method based on the proportion of sample results delivered is not expected to be a faithful depiction of progress, we utilize an input method based on estimates of effort completed using a cost-based model.

In 2018, we earned $10.0 million in regulatory milestones upon the achievement of the regulatory milestones by us and our respective customers' therapeutics. All $10.0 million was recognized as

revenue as we determined these amounts were consistent with our estimated standalone selling price and the respective performance obligations were complete. We recognized $5.1 million and $12.8 million in development revenue related to these contracts in 2017 and 2018, respectively.

As of December 31, 2018, in future periods we could receive up to an additional $99.5 million in milestone payments if certain regulatory approvals are obtained by our customers' therapeutics in connection with MRD data generated from our clonoSEQ test.

Genentech Collaboration Agreement

In December 2018, we entered into a collaboration with Genentech to leverage our capability to develop cellular therapies in oncology. Subsequent to receipt of regulatory approval in January 2019, we received an upfront payment of $300.0 million in February 2019 and may be eligible to receive more than $1.8 billion over time, including payments of up to $75.0 million upon the achievement of specified regulatory milestones, up to $300.0 million upon the achievement of specified development milestones, and up to $1.4 billion upon the achievement of specified commercial milestones. In addition, we are eligible to receive tiered royalties at a rate ranging from the mid-single digits to the mid-teens on aggregate worldwide net sales of products arising from the collaboration, subject to certain reductions, with aggregate minimum floors.

4. Fair Value Measurements

The following table sets forth the fair value of financial assets and liabilities that were measured at fair value on a recurring basis (in thousands):

	December 31, 2017			
	Level 1	Level 2	Level 3	Total
Financial assets				
Money market funds	$68,034	$ —	$ —	$ 68,034
Commercial paper	—	22,360	—	22,360
U.S. government and agency securities	—	83,717	—	83,717
Corporate bonds	—	21,264	—	21,264
Total financial assets	$68,034	$127,341	$ —	$195,375
Financial liabilities				
Convertible preferred stock warrant liability	$ —	$ —	$ 342	$ 342
Total financial liabilities	$ —	$ —	$ 342	$ 342

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	December 31, 2018			
	Level 1	Level 2	Level 3	Total
Financial assets				
Money market funds	$45,998	$ —	$ —	$ 45,998
Commercial paper	—	16,887	—	16,887
U.S. government and agency securities	—	85,623	—	85,623
Corporate bonds	—	7,478	—	7,478
Total financial assets	$45,998	$109,988	$ —	$155,986
Financial liabilities				
Convertible preferred stock warrant liability	$ —	$ —	$ 336	$ 336
Total financial liabilities	$ —	$ —	$ 336	$ 336

Level 1 securities include highly liquid money market funds, which we measure the fair value based on quoted prices in active markets for identical assets or liabilities. Level 2 securities consist of U.S. government debt securities, U.S. government agency bonds, commercial paper and corporate bonds, and are valued based on recent trades of securities in inactive markets or based on quoted market prices of similar instruments and other significant inputs derived from or corroborated by observable market data. Level 3 liabilities that are measured at fair value on a recurring basis consist of a convertible preferred stock warrant liability.

The fair value of the convertible preferred stock warrant liability is estimated using the Black-Scholes option-pricing model. Certain inputs were utilized in the option-pricing model as follows:

	December 31, 2017	December 31, 2018
Fair value estimate	$ 7.67	$ 8.27
Expected term (in years)	3.31	2.31
Risk-free interest rate	2.0%	2.5%
Expected volatility	61.5%	55.3%
Expected dividend yield	—	—

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5. Investments

Available-for-sale investments consist of the following as of December 31, 2017 and 2018 (in thousands):

	December 31, 2017			
	Amortized cost	Unrealized gain	Unrealized loss	Estimated fair value
Short-term marketable securities				
Commercial paper	$ 10,769	$ —	$ —	$ 10,769
U.S. government and agency securities	74,937	—	(125)	74,812
Corporate bonds	21,284	—	(20)	21,264
Total short-term marketable securities	$106,990	$ —	$ (145)	$106,845
Long-term marketable securities				
U.S. government and agency securities	$ 8,926	$ —	$ (21)	$ 8,905
Total long-term marketable securities	$ 8,926	$ —	$ (21)	$ 8,905

	December 31, 2018			
	Amortized cost	Unrealized gain	Unrealized loss	Estimated fair value
Short-term marketable securities				
Commercial paper	$ 16,887	$ —	$ —	$ 16,887
U.S. government and agency securities	85,722	—	(99)	85,623
Corporate bonds	7,486	—	(8)	7,478
Total short-term marketable securities	$110,095	$ —	$ (107)	$109,988

The following table presents the gross unrealized holding losses and fair value for investments in an unrealized loss position, and the length of time that individual securities have been in a continuous loss position, as of December 31, 2018 (in thousands):

	December 31, 2018			
	Less than 12 months		12 months or greater	
	Fair value	Unrealized loss	Fair value	Unrealized loss
Short-term marketable securities				
Corporate bonds	$ 7,478	$ (8)	$ —	$ —
U.S. government and agency securities	76,654	(85)	8,969	(14)
Total short-term marketable securities	$84,132	$ (93)	$8,969	$ (14)

We evaluated our securities for other-than-temporary impairment and considered the decline in market value for the securities to be primarily attributable to current economic and market conditions. It is not more likely than not that we will be required to sell the securities, and we do not intend to do so prior to the recovery of the amortized cost basis. Based on this analysis, these marketable securities were not considered to be other-than-temporarily impaired as of December 31, 2018.

All the corporate debt, U.S. government and agency securities, and commercial paper have an effective maturity date of less than one year.

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6. Property and Equipment, Net

Property and equipment consist of the following (in thousands):

	December 31, 2017	December 31, 2018
Laboratory equipment	$12,330	$ 14,009
Computer equipment	1,507	1,819
Furniture and equipment	971	1,300
Computer software	464	429
Construction in progress	376	3,942
Leasehold improvements	7,631	10,078
Property and equipment, at cost	23,279	31,577
Less accumulated depreciation	(9,325)	(12,452)
Property and equipment, net	$13,954	$ 19,125

Depreciation expense was $4.1 million and $4.3 million for the years ended December 31, 2017 and 2018, respectively.

7. Goodwill and Intangible Assets

Intangible assets subject to amortization as of the dates presented consist of the following (in thousands):

	December 31, 2017		
	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
Acquired developed technology	$20,000	$ (4,969)	$15,031
Purchased intellectual property	325	(31)	294
Balance at December 31, 2017	$20,325	$ (5,000)	$15,325

	December 31, 2018		
	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
Acquired developed technology	$20,000	$ (6,636)	$13,364
Purchased intellectual property	325	(63)	262
Balance at December 31, 2018	$20,325	$ (6,699)	$13,626

The developed technology was acquired in connection with our acquisition of Sequenta, Inc. in 2015. The remaining balance of the acquired technology and the purchased intellectual property is expected to be amortized over the next approximately eight years in the amount of $1.7 million per year. There have been no changes in the carrying amount of goodwill since its recognition in 2015.

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8. Accrued Liabilities

Accrued liabilities consist of the following (in thousands):

	December 31, 2017	December 31, 2018
Accrued legal and professional fees	$ 598	$1,634
Accrued royalties	22	31
Accrued travel and entertainment	44	73
Other vendor accruals	379	824
Total accrued liabilities	$1,043	$2,562

9. Deferred Revenue

Deferred revenue by revenue classification was as follows (in thousands):

	December 31, 2017	December 31, 2018
Deferred sequencing revenue	$11,747	$11,754
Deferred development revenue	2,301	1,645
Total deferred revenue	$14,048	$13,399

The opening balance of deferred revenue was $10.4 million as of January 1, 2017. In 2018, as a result of cancelled customer sequencing contracts, we recognized $3.4 million of sequencing revenue.

Changes in deferred revenue were as follows (in thousands):

	December 31, 2018
Deferred revenue balance at December 31, 2017	$ 14,048
Additions to deferred revenue during the period	9,727
Revenue recognized during the period	(10,376)
Deferred revenue balance at December 31, 2018	$ 13,399

10. Commitments and Contingencies

Operating Leases

We have entered into various non-cancelable lease agreements for our office and laboratory spaces.

In July 2011, we entered into a non-cancelable lease agreement with a minority shareholder for laboratory and office space in Seattle, Washington. The lease terms were subsequently amended multiple times, most recently in June 2016. The lease terminates in June 2023. The lease also requires us to pay additional amounts for operating and maintenance expenses.

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In October 2016, we entered into an agreement to sublease certain laboratory and office space in South San Francisco, California. The lease commenced in October 2016 and terminates in March 2019. The lease requires us to pay additional amounts for operating and maintenance expenses.

In April 2018, we entered into a lease agreement to lease additional space in South San Francisco, California. The lease term is through March 2026 and provides for one five-year option. We will be responsible for our share of allocable operating expenses, tax expenses and utilities cost during the duration of the lease term. In connection with the lease, the landlord funded agreed-upon improvements prior to the lease commencement date of December 12, 2018. The landlord was solely responsible for the $2.4 million cost of such improvements, which we recognized as a leasehold improvement asset that depreciates beginning from the commencement date to the initial lease term, and a corresponding leasehold incentive obligation, which is amortized over the life of the lease.

As of December 31, 2018, future minimum lease payments, exclusive of operating and maintenance costs, are as follows (in thousands):

2019	$ 3,561
2020	3,819
2021	3,917
2022	4,017
2023	2,295
Thereafter	2,315
Total future minimum lease payments	$19,924

Rent expenses, inclusive of operating and maintenance costs, were $3.7 million and $4.1 million for the years ended December 31, 2017 and 2018, respectively.

Legal Proceedings

We are subject to claims and assessments from time to time in the ordinary course of business. We will accrue a liability for such matters when it is probable that a liability has been incurred and the amount can be reasonably estimated. When only a range of possible loss can be established, the most probable amount in the range is accrued. If no amount within this range is a better estimate than any other amount within the range, the minimum amount in the range is accrued. We are not currently party to any material legal proceedings.

Indemnification Agreements

In the ordinary course of business, we may provide indemnification of varying scope and terms to vendors, lessors, customers and other parties with respect to certain matters including, but not limited to, losses arising out of breach of such agreements or from intellectual property infringement claims made by third parties. In addition, we have entered into indemnification agreements with members of our Board of Directors and certain of our executive officers that will require us to indemnify them against certain liabilities that may arise by reason of their status or service as directors or officers. The maximum potential amount of future payments that we could be required to make under these indemnification agreements is, in many cases, unlimited. We have not incurred any material costs as a result of such indemnifications and are not currently aware of any indemnification claims.

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11. Convertible Preferred Stock

Convertible preferred stock at December 31, 2018 consists of the following (in thousands, except share data):

	Shares authorized	Shares issued and outstanding	Amount	Liquidation preference
Series A	4,550,000	4,550,000	$ 12,405	$ 4,550
Series B	5,645,706	5,645,706	16,017	9,669
Series C	4,804,227	4,747,352	14,425	12,521
Series D	19,269,117	19,269,117	106,905	106,999
Series E	15,524,350	15,524,350	93,698	93,750
Series E-1	17,407,441	16,605,244	72,568(1)	100,277
Series F	21,761,676	21,761,676	195,013	195,100
Series F-1	4,800,000	4,686,649	49,827	50,000
Total convertible preferred stock	93,762,517	92,790,094	$560,858	$572,866

(1) Includes vested Series E-1 convertible preferred stock options of $1.8 million which are not included in the shares issued and outstanding.

Conversion

Each share of convertible preferred stock is convertible at the option of the holder into one fully paid and non-assessable share of common stock. The initial conversion price per share is $1.0000, $1.7127, $2.6374, $5.5529, $6.0389, $6.0389, $8.9653 and $10.6686 per share for the Series A convertible preferred stock, Series B convertible preferred stock, Series C convertible preferred stock, Series D convertible preferred stock, Series E convertible preferred stock, Series E-1 convertible preferred stock, Series F convertible preferred stock and Series F-1 convertible preferred stock, respectively.

Shares of convertible preferred stock are automatically converted into shares of the common stock upon the closing of a public offering, provided that our gross proceeds are not less than $25.0 million. Shares of Series A convertible preferred stock, Series B convertible preferred stock and Series C convertible preferred stock are automatically converted into shares of the common stock upon the affirmative vote of the holders of a majority of such shares, voting together as a single class on an as-converted basis. Shares of Series D convertible preferred stock and Series E convertible preferred stock are automatically converted into shares of the common stock upon the affirmative vote of the holders of the majority of such shares voting together as a single class on an as-converted basis. Shares of Series E-1 convertible preferred stock are automatically converted into shares of common stock upon the affirmative vote of the holders of the majority of such shares on an as-converted basis. Shares of Series F convertible preferred stock and Series F-1 convertible preferred stock are automatically converted into shares of the common stock upon the affirmative vote of the holders of the majority of such shares, voting together as a single class on as-converted basis.

Dividends

The holders of convertible preferred stock shall be entitled to receive dividends, when and if declared by our Board of Directors, out of any assets legally available, prior and in preference to any

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declaration or payment of any dividend on the common stock, equal to the greater of (a) in the case of the Series F-1 convertible preferred stock, $0.8535 per outstanding share per year from and after the date of first issuance of such share (subject to proportional adjustment in the event of a recapitalization), (b) in the case of the Series F convertible preferred stock, $0.7172 per outstanding share per year from and after the date of first issuance of such share (subject to proportional adjustment in the event of a recapitalization), (c) in the case of the Series E convertible preferred stock, $0.4831 per outstanding share per year from and after the date of first issuance of such share (subject to proportional adjustment in the event of a recapitalization) (d) in the case of the Series D convertible preferred stock, $0.4442 per outstanding share per year from and after the date of first issuance of such share (subject to proportional adjustment in the event of a recapitalization) and (e) in the case of all other junior convertible preferred stock, the dividend that would have been payable with respect to such share if it had first been converted to common stock.

Liquidation Preference

In the event of any liquidation event, the holders of Series F convertible preferred stock and Series F-1 convertible preferred stock shall be entitled to receive, on a *pari passu* basis, before any payment is made to the holders of the Series D convertible preferred stock and Series E convertible preferred stock or the common stock, an amount equal to the greater of (1) the applicable original issue price, plus any declared but unpaid dividends thereon or (2) such amount per share as would have been payable had each share been converted into common stock immediately prior to the liquidation event.

Upon completion of the distribution noted above, the holders of Series E convertible preferred stock and Series D convertible preferred stock shall be entitled to receive, on a *pari passu* basis, before any payment is made to the holders of the Series A convertible preferred stock, Series B convertible preferred stock, Series C convertible preferred stock or the common stock, an amount equal to the greater of (1) applicable the original issue price, plus any declared but unpaid dividends thereon or (2) such amount per share as would have been payable had each share been converted into common stock immediately prior to the liquidation event.

Upon completion of the distribution noted above, the holders of Series A convertible preferred stock, Series B convertible preferred stock, and Series C convertible preferred stock shall be entitled to receive, on a *pari passu* basis, before any payment is made to the holders of the Series E-1 convertible preferred stock or the common stock, an amount equal to the greater of (1) the applicable original issue price, plus any declared but unpaid dividends thereto, or (2) such amount per share as would have been payable had each share been converted into common stock immediately prior to the liquidation event.

Upon completion of the distribution noted above, our remaining assets available for distribution to shareholders shall be distributed with equal priority and pro rata among the holders of Series E-1 convertible preferred stock and common stock (not including the Series A convertible preferred stock, Series B convertible preferred stock, Series C convertible preferred stock, Series D convertible preferred stock, Series E convertible preferred stock, Series F convertible preferred stock and Series F-1 convertible preferred stock on an as-if converted basis).

Voting

Each holder of convertible preferred stock shall be entitled to vote on all matters submitted to a vote by shareholders and shall be entitled to that number of votes equal to the number of shares of

common stock into which such holder's shares of convertible preferred stock are convertible, at the record date. Except as otherwise expressed, the holders of shares of convertible preferred stock and common stock shall vote together as a single class on all matters.

Redemption

So long as 4.0 million shares of our Series D convertible preferred stock, Series E convertible preferred stock, Series F convertible preferred stock and Series F-1 convertible preferred stock ("Senior Preferred Stock") are outstanding, we cannot, without the consent of the majority of the holders of the Senior Preferred Stock, on an as-converted basis, purchase or redeem any other class or series of capital stock, including preferred stock.

Classification

We have classified convertible preferred stock as mezzanine equity in the balance sheets as the shares are contingently redeemable upon a deemed liquidation such as a change in control and in that event there is no guarantee that all shareholders would be entitled to receive the same form of consideration. No accretion was recorded during the years ended December 31, 2017 and 2018 as a deemed liquidation event was not considered probable.

Series E-1 Convertible Preferred Stock Options

Included in convertible preferred stock is $1.8 million for the redemption value of outstanding Series E-1 convertible preferred stock options that are vested as of December 31, 2018. Upon the closing of a public offering these convertible preferred stock options will convert on a one-for-one basis to options in common stock with no adjustments to exercise price.

12. Shareholders' Deficit

Common Stock

We are authorized to issue 131,000,000 shares of common stock. Our common stock has a par value of $0.0001, no preferences or privileges and is not redeemable. Holders of our common stock are entitled to one vote for each share of common stock held.

We have reserved shares of common stock for the following as of December 31, 2018:

Shares to be issued upon conversion of all series of convertible preferred stock	92,790,094
Shares to be issued upon exercise of outstanding common stock options	14,893,253
Shares available for future stock option grants	6,827,996
Shares to be issued upon exercise of outstanding Series E-1 convertible preferred stock options	264,677
Shares to be issued upon conversion of Series C convertible preferred stock in connection with warrant exercise	56,875
Shares to be issued upon conversion of common stock warrants	55,032
Shares of common stock reserved for future issuance	114,887,927

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Common Stock Warrants

In connection with two transactions in 2012 and 2013, we granted warrants to purchase up to 55,032 shares of common stock. The warrants are exercisable at any time for a period of ten years from the date of issuance at an average exercise price of $0.37, except in the case of warrants to purchase 20,000 shares of common stock at an exercise price of $0.45 per share that may expire if unexercised prior to the closing of a public offering.

13. Equity Incentive Plans

Adaptive 2009 Equity Incentive Plan

We adopted an equity incentive plan during 2009 ("2009 Plan") that provides for the issuance of incentive and nonqualified common stock options, and other share-based awards for employees, directors and consultants. Under the 2009 Plan, the option exercise price for incentive and nonqualified stock options may not be less than the fair market value of our common stock at the date of grant as determined by the Board of Directors. Options expire no later than ten years from the grant date, and vesting is established at the time of grant. As of December 31, 2018, we have authorized 21,721,249 shares of common stock for issuance under the 2009 Plan.

A summary of our option and restricted stock unit ("RSU") activity is as follows:

	Shares available for grant	Shares subject to outstanding options	Weighted-average exercise price per share	Aggregate intrinsic value (in thousands)
Outstanding at December 31, 2016	3,423,473	12,985,266	$ 3.46	$ 37,138
Authorized	—	—	—	
Options granted	(1,604,496)	1,604,496	6.27	
RSUs forfeited	880,487	(880,487)	—	
Forfeited	2,086,035	(2,086,035)	5.80	
Exercised	—	(54,685)	1.73	
Outstanding at December 31, 2017	4,785,499	11,568,555	3.70	32,970
Authorized	6,000,000	—	—	
Options granted	(4,764,625)	4,764,625	6.55	
Forfeited	807,122	(807,122)	5.54	
Exercised	—	(632,805)	1.85	
Outstanding at December 31, 2018	6,827,996	14,893,253	4.59	39,864

In 2016, we granted 880,487 RSUs. The vesting of the shares required the satisfaction of both a service and an event condition. In 2017, these RSUs were forfeited due to the employee's termination prior to the occurrence of either conditions.

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The following table summarizes information about stock options outstanding and exercisable at December 31, 2018:

Exercise price	Options outstanding	Weighted-average remaining contractual life (years)	Options exercisable	Aggregate intrinsic value (in thousands)
$ 0.16	469,109	1.36	469,109	
0.33	1,428,959	2.90	1,428,959	
0.45	641,000	3.95	641,000	
0.84	1,115,225	5.05	1,115,225	
1.98	1,040,500	5.65	1,040,500	
4.07	409,194	6.22	395,005	
6.27	672,353	6.73	402,321	
6.32	4,431,538	6.71	3,623,123	
6.55	4,685,375	9.29	947,049	
	14,893,253	6.66	10,062,291	$ 36,089

The weighted-average exercise price for options exercisable as of December 31, 2018 was $3.68. The weighted-average grant date fair value of options granted was $4.00 and $4.15 during the years ended December 31, 2017 and 2018, respectively. The total intrinsic value of awards exercised was $0.3 million and $3.0 million during the years ended December 31, 2017 and 2018, respectively.

Sequenta, Inc. 2008 Stock Plan, as amended

In connection with our acquisition of Sequenta Inc. in January 2015, we assumed Sequenta's Equity Incentive Plan ("2008 Plan"), including all outstanding options and shares available for future issuance under the 2008 Plan, which are all exercisable for Series E-1 convertible preferred stock.

A summary of our Series E-1 convertible preferred stock option activity is as follows:

	Convertible preferred shares subject to outstanding options	Weighted-average exercise price per share	Aggregate intrinsic value (in thousands)
Outstanding at December 31, 2016	814,563	$ 0.56	$ 4,814
Options granted	—	—	
Forfeited	(121,898)	0.55	
Exercised	(171,526)	0.74	
Outstanding at December 31, 2017	521,139	0.50	3,195
Options granted	—	—	
Forfeited	(122,397)	0.36	
Exercised	(134,065)	0.75	
Outstanding at December 31, 2018	264,677	0.44	1,826

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The following table summarizes information about convertible preferred stock options outstanding and exercisable at December 31, 2018:

Exercise price	Options outstanding	Weighted-average remaining contractual life (years)	Options exercisable	Aggregated intrinsic value (in thousands)
$ 0.10	104,652	0.63	104,652	
0.28	10,153	2.23	10,153	
0.55	74,473	4.08	74,473	
0.82	70,518	5.12	70,480	
0.92	4,881	5.37	4,881	
	264,677	2.94	264,639	$ 1,826

There were no preferred options granted during the years ended December 31, 2017 and 2018. The total intrinsic value of awards exercised was $1.0 million and $0.8 million during the years ended December 31, 2017 and 2018, respectively.

Fair value of options granted

The estimated fair value of options granted during 2017 and 2018 was estimated using the Black-Scholes option-pricing model with the following weighted-average assumptions for our 2009 Plan:

	Year Ended December 31,	
	2017	2018
Grant date fair value	$6.27	$6.55
Expected term (in years)	6.12	6.14
Risk-free interest rate	2.0%	2.7%
Expected volatility	70.2%	68.1%
Expected dividend yield	—	—

The determination of the fair value of stock options on the date of grant using a Black-Scholes option-pricing model is affected by the estimated fair value of our common stock, as well as assumptions regarding a number of variables that are complex, subjective and generally require significant judgment to determine. The valuation assumptions were determined as follows:

Fair value of common stock—The grant date fair value of our common stock has been determined by our Board of Directors with input from management. The grant date fair value of the common stock was determined using valuation methodologies which utilizes certain assumptions, including probability weighting of events, volatility, time to liquidation, a risk-free interest rate and an assumption for a discount for lack of marketability (Level 3 inputs). In determining the fair value of the common stock, the methodologies used to estimate the enterprise value were performed using methodologies, approaches and assumptions consistent with the American Institute of Certified Public Accountants Accounting Practice Aid, *Valuation of Privately-Held-Company Equity Securities Issued as Compensation*.

Expected term—The expected life of options granted to employees is determined using the “simplified” method, as illustrated in ASC Topic 718, *Compensation—Stock Compensation*, as we do

not have sufficient exercise history to determine a better estimate of expected term. Under this approach, the expected term is presumed to be the average of the weighted-average vesting term and the contractual term of the option.

Risk-free interest rate—We utilize a risk-free interest rate in the option valuation model based on U.S. Treasury zero-coupon issues, with remaining terms similar to the expected term of the options.

Expected volatility—As we do not have any trading history for our common stock, the expected volatility is based on the historical volatility of our publicly traded industry peers utilizing a period of time consistent with our estimate of expected term.

Expected dividend yield—We do not anticipate paying any cash dividends in the foreseeable future and, therefore, use an expected dividend yield of zero in the option valuation model.

Share-based compensation expense of $7.0 million and $11.1 million was recognized during the years ended December 31, 2017 and 2018, respectively. The compensation costs related to stock options are included in the statements of operations as follows (in thousands):

	Year Ended December 31,	
	2017	2018
Cost of revenue	$ 237	$ 398
Research and development	2,375	2,896
Sales and marketing	1,344	2,891
General and administration	3,053	4,964
Total share-based compensation expense	$ 7,009	$ 11,149

There were no stock option modifications during the year ended December 31, 2017. During the year ended December 31, 2018, there was one option modification to extend the option exercise period which resulted in incremental stock compensation of $0.5 million. The total grant date fair value of the stock options that vested during the years ended December 31, 2017 and 2018, excluding the impact of modifications, approximated the share-based compensation expense recorded during the respective periods.

At December 31, 2018, unrecognized share-based compensation expense related to unvested stock options was $18.3 million, which is expected to be recognized over a remaining weighted-average period of 2.72 years.

14. Restructuring Charges

On June 17, 2016, we announced that we were consolidating our South San Francisco, California laboratory operations into our Seattle, Washington location to recognize cost savings. The transition of activities was completed in April 2017.

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The following table summarizes the activity within the restructuring related balance sheet accounts during the year ended December 31, 2017 (in thousands):

	One-time termination benefits	Asset impairments and net loss on sale or disposal	Other[1]	Total
Balance at December 31, 2016	$ 2,564	$ —	$ —	$ 2,564
Costs incurred and charged to expense	512	210	118	840
Cash payments	(3,076)	—	(118)	(3,194)
Non-cash items	—	(210)	—	(210)
Balance at December 31, 2017	$ —	$ —	$ —	$ —

(1) "Other" primarily reflects activities associated with the consolidation of our facilities and manufacturing operations, including contract termination costs.

15. Microsoft Collaboration Agreement

Summary of Agreement

In December 2017, we entered into a collaboration agreement with Microsoft Corporation ("Microsoft Agreement") to computationally derive a comprehensive TCR antigen map for purposes of developing a universal diagnostic based on a single blood test.

During the term of the Microsoft Agreement, each party has granted the other certain limited use licenses to one another's intellectual property rights and has agreed to certain defined exclusivity obligations with respect to collaborations and projects that are substantially similar. The licenses, exclusivity, data, software and related development services are for the purposes of achieving the objectives of the collaboration. We retain all license rights to commercialize any immunological research, diagnostic and therapeutic products and services that arise out of the collaboration, and we have no financial commitments to Microsoft other than our commitment to purchase Microsoft's Azure cloud services. Contemporaneously with the Microsoft Agreement, we entered into a separate agreement to use Microsoft's Azure cloud services at standard volume pricing with a minimum Azure consumption requirement of $12.0 million over the seven-year term of the Microsoft Agreement, which we expect to meet in the ordinary course of business. We have also agreed to host each diagnostic product developed as a direct result of the Microsoft Agreement on Microsoft's Azure cloud services throughout the term of the Microsoft Agreement and for a period of five years thereafter.

Each party must make good faith and reasonable efforts to carry out its obligations under the Microsoft Agreement, but there are no contractual minimums or maximums of resource efforts aside from our commitment pertaining to the purchase of Microsoft's Azure cloud services. Each party is responsible for its own costs incurred over the course of the collaboration, and there is no other cash consideration, royalty rights or other economic interests provided by Microsoft or payable by us to Microsoft, aside from our commitment to utilize Microsoft's Azure cloud services.

In addition, contemporaneously with entering into the Microsoft Agreement, Microsoft made a preferred stock investment of approximately $45.0 million as a part of our Series F-1 convertible preferred stock issuance.

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Summary of Accounting

The terms of the Microsoft Agreement meet the criteria under ASC Topic 808, *Collaborative Arrangements* ("ASC 808"), as both parties are active participants in the activity and are exposed to significant risks and rewards dependent on the commercial success of the activity.

ASC 808 does not provide guidance on how to account for the activities under the collaboration, and we determined that Microsoft did not meet the definition of a customer under ASC 606. Accordingly, we looked to other guidance to determine the accounting for the respective elements.

We determined that the preferred stock issuance and commitment to use Microsoft's Azure cloud services were made at terms consistent with market rates. All consideration received as part of the Series F-1 convertible preferred stock issuance was accounted for as part of the Series F-1 preferred stock issuance.

Since the commitment to use Microsoft's Azure cloud services was at market terms and we expect to meet the commitment in the ordinary course of business during the seven-year term, we record the expenses in the period in which the services are consumed. These costs are recorded in the statement of operations based on the underlying activities for which they support.

The remaining elements of the agreement were highly interrelated, so we evaluated them in the aggregate to determine the appropriate accounting application. Specifically, we determined that the transfer of license rights between the parties, our commitment to provide data and immunomics, diagnostic and bioinformatics expertise to Microsoft and Microsoft's commitment to provide machine learning software and related development services to us were highly interrelated because they were necessary for the parties to perform the activities under the Microsoft Agreement and, therefore, should be evaluated as one unit of account.

We accounted for these collaboration activities by analogy to ASC Topic 845, *Nonmonetary Transactions*, and determined that major uncertainties exist about the realizability of the value that would be assigned to an asset received from or provided to Microsoft under the collaboration and, therefore, fair value could not be reliably measured. As a result, we did not recognize any non-monetary assets or corresponding non-monetary income or expenses pertaining to the rights provided to us or to be received by us under the Microsoft Agreement.

We will use our employees, laboratory resources and related overhead to perform our obligations under the Microsoft Agreement. Our existing research and development activities relate to the development of a TCR-antigen database (antigen map) from which specific new clinical diagnostic products may be developed. These activities will support our collaboration with Microsoft and the related research and development expenses are included in our statement of operations.

For the year ended December 31, 2018, we recognized $0.5 million in research and development expense related to Microsoft's Azure cloud services provided to us.

Adaptive Biotechnologies Corporation
Notes to Financial Statements

December 31, 2018

16. Income Taxes

Deferred income taxes reflect the net tax effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. The significant components of our deferred tax assets and liabilities are as follows (in thousands):

	December 31,	
	2017	2018
Deferred tax assets:		
Net operating losses	$ 47,840	$ 56,555
Tax credit carryforward	5,463	6,709
Non qualifying stock options	4,865	7,861
Other	3,774	4,523
Total deferred tax assets	61,942	75,648
Valuation allowance	(56,679)	(70,722)
Deferred tax assets, net of valuation allowance	5,263	4,926
Deferred tax liabilities:		
Tangible and intangible assets	(5,263)	(4,926)
Net deferred taxes	$ —	$ —

ASC Topic 740, *Income Taxes*, requires that the tax benefit of net operating losses, temporary differences and credit carryforwards be recorded as an asset to the extent that management assesses that realization is “more likely than not.” Realization of the future tax benefits is dependent on our ability to generate sufficient taxable income within the carryforward period. Because of our history of operating losses, management believes that recognition of the deferred tax assets arising from the above-mentioned future tax benefits is currently not likely to be realized and, accordingly, has provided a valuation allowance. The valuation allowance decreased $9.7 million and increased by $14.0 million during the years ended December 31, 2017 and 2018, respectively.

On December 22, 2017, the Tax Cuts and Jobs Act of 2017 (“TCJA”) was signed into law, making significant changes to the Internal Revenue Code, including a decrease in the federal corporate tax rate from 35% to 21%. Taxpayers are required to recognize the effect of tax law changes in the period of enactment. The re-measurement resulted in a total decrease in these net assets equal to $25.0 million, which was fully offset by a corresponding reduction in the valuation allowance. As of December 31, 2018, we completed our assessment of the impact of the changes due to the TCJA and the provisional amounts recorded are final.

Federal tax laws impose substantial restrictions on the utilization of net operating loss and credit carryforwards in the event of an ownership change, as defined in Section 382 of the Internal Revenue Code. Accordingly, our ability to utilize these carryforwards may be limited due to such ownership change. We have completed a Section 382 analysis for approximately $186.9 million of our federal operating losses and there are no permanent limitations on the utilization of our federal net operating losses as of December 31, 2018. Net operating losses generated by Sequenta, Inc. of approximately $38.5 million prior to the our acquisition in January of 2015 were excluded from this analysis and maybe limited as we have not completed a Section 382 analysis. Under the newly enacted federal

income tax law, federal net operating losses incurred in 2018 and in future years may be carried forward indefinitely, but the deductibility of such federal net operating losses is limited. Net operating losses generated prior to 2018 are eligible to carried forward up to 20 years. As of December 31, 2018, we had U.S. federal net operating losses of $47.3 million and U.S. federal tax credits of $6.0 million. The tax credit and net operating loss carryforwards will begin to expire in 2028.

The effective tax rate of our provision for income taxes differs from the federal statutory rate as follows:

	Year ended December 31,	
	2017	2018
Statutory rate	34.0%	21.0%
State tax	1.8	5.5
Stock compensation	(1.7)	0.5
Permanent items	(0.1)	0.5
Credits	2.7	2.7
TCJA change in federal rate	(58.4)	—
Other	(0.7)	0.2
Change in valuation allowance	22.3	(30.3)
Total	0.0%	0.0%

We recognize, in our financial statements, the effect of a tax position when it is more likely than not, based on the technical merits, that the position will be sustained upon examination. We had unrecognized tax benefits of approximately $1.3 million as of December 31, 2018. A reconciliation of the beginning and ending amounts of unrecognized tax benefits during the two years ended December 31, 2017 and 2018 are as follows (in thousands):

Balance at December 31, 2016	$ 844
Additions in 2017	187
Balance at December 31, 2017	1,031
Additions in 2018	229
Balance at December 31, 2018	$1,260

During the years ended December 31, 2017 and 2018, we recognized uncertain tax positions of $0.2 million related to a reduction of the research and development credit deferred tax asset. Unrecognized tax benefits may change during the next twelve months for items that arise in the ordinary course of business. We do not anticipate a material change to our unrecognized tax benefits over the next twelve months that would have an adverse effect on our operating results.

We recognize interest and penalties accrued on any unrecognized tax benefits as a component of income tax expense. We had no accrued interest or penalties related to uncertain tax positions as of December 31, 2017 and 2018.

We file federal and certain state income tax returns, which provide varying statutes of limitations on assessments. However, because of net operating loss carryforwards, substantially all tax years since inception remain open to federal and state tax examination.

Adaptive Biotechnologies Corporation
Notes to Financial Statements

December 31, 2018

17. Net Loss and Unaudited Pro Forma Net Loss Per Share Attributable to Common Shareholders

Net Loss Per Share

The following table sets forth the computation of the basic and diluted net loss per share attributable to common shareholders (in thousands, except shares and per share amounts):

	Year ended December 31,	
	2017	2018
Net loss	$ (42,831)	$ (46,447)
Fair value adjustments to redemption value for Series E-1 convertible preferred stock options	135	102
Net loss attributable to common shareholders, basic and diluted	$ (42,696)	$ (46,345)
Weighted-average shares used in computing net loss per share	12,196,998	12,629,778
Net loss per share attributable to common shareholders, basic and diluted	$ (3.50)	$ (3.67)

Since we were in a loss position for all periods presented, basic net loss per share attributable to common shareholders is the same as diluted net loss per share attributable to common shareholders, as the inclusion of all potential shares of common stock outstanding would have been anti-dilutive. The following weighted-average common stock equivalents were excluded from the calculation of diluted net loss per share attributable to common shareholders for the periods presented as they had an anti-dilutive effect:

	Year ended December 31,	
	2017	2018
Convertible preferred stock (on as if converted basis)	88,473,431	92,783,867
2009 Plan stock options issued and outstanding	12,022,454	14,368,063
2008 Plan stock options issued and outstanding	622,472	333,563
Common stock warrants	55,032	55,032
Convertible preferred stock warrants	56,875	56,875
Total	101,230,264	107,597,400

Adaptive Biotechnologies Corporation
Notes to Financial Statements

December 31, 2018

Unaudited Pro Forma Net Loss Per Share

The following table sets forth the computation of the unaudited pro forma basic and diluted net loss per share attributable to common shareholders (in thousands, except shares and per share amounts):

	Year Ended December 31, 2018
Numerator:	
Pro forma net loss attributable to common shareholders, basic and diluted	$ (46,345)
Denominator:	
Weighted-average shares used in computing net loss per share attributable to common shareholders, basic and diluted	12,629,778
Weighted-average shares of common stock issued upon assumed conversion of convertible preferred stock in an IPO	92,783,867
Weighted-average shares of common stock issued upon assumed conversion of a common stock warrant in an IPO	20,000
Weighted-average shares used in computing pro forma net loss per share attributable to common shareholders, basic and diluted	105,433,645
Pro forma net loss per share attributable to common shareholders, basic and diluted	$ (0.44)

18. Retirement Plan

We maintain a salary deferral 401(k) plan (“401(k) Plan”), covering employees who have met certain eligibility requirements. Employees may defer up to 100% of their compensation to the 401(k) Plan, subject to federal limits. We did not make any discretionary contributions during the years ended December 31, 2017 and 2018.

19. Subsequent Events

In January 2019, clonoSEQ received Medicare coverage aligned with the FDA label and National Comprehensive Cancer Network guidelines for longitudinal monitoring in certain blood cancers.

In the first quarter of 2019, the Board of Directors approved additional stock option grants under our 2009 Plan of 2,045,000 shares to certain employees and 105,000 shares to non-employee directors. All option grants were issued with option exercise prices of $7.27 per share and subject to continuing service vesting conditions.

Management has reviewed and evaluated material subsequent events from the balance sheet date of December 31, 2018, through the date the financial statements were available to be issued, March 29, 2019. Other than the matters noted above, no subsequent events have been identified for disclosure.

Adaptive Biotechnologies Corporation
Condensed Balance Sheets

(in thousands, except share and per share amounts)

	December 31, 2018	March 31, 2019 (unaudited)	Pro Forma as of March 31, 2019 (unaudited)
Assets			
Current assets			
Cash and cash equivalents	$ 55,030	$ 111,281	$ 111,290
Short-term marketable securities	109,988	329,150	329,150
Accounts receivable, net	4,807	4,066	4,066
Inventory	7,838	7,855	7,855
Prepaid expenses and other current assets	3,055	6,787	6,787
Total current assets	180,718	459,139	459,148
Long-term assets			
Property and equipment, net	19,125	21,184	21,184
Restricted cash and other assets	247	2,073	2,073
Intangible assets, net	13,626	13,207	13,207
Goodwill	118,972	118,972	118,972
Total assets	$ 332,688	$ 614,575	$ 614,584
Liabilities, convertible preferred stock and shareholders' (deficit) equity			
Current liabilities			
Accounts payable	$ 1,793	$ 3,266	$ 3,266
Accrued liabilities	2,562	4,727	4,727
Accrued compensation and benefits	4,641	2,039	2,039
Current portion of deferred rent	1,109	1,195	1,195
Current deferred revenue	12,695	52,024	52,024
Total current liabilities	22,800	63,251	63,251
Long-term liabilities			
Convertible preferred stock warrant liability	336	353	—
Deferred rent liability, less current portion	6,102	5,781	5,781
Deferred revenue, less current portion	704	257,454	257,454
Total liabilities	29,942	326,839	326,486
Commitments and contingencies (Note 8)			
Convertible preferred stock: $0.0001 par value, 93,762,517 shares authorized at December 31, 2018 and March 31, 2019, respectively; 92,790,094 and 93,023,694 shares issued and outstanding at December 31, 2018 and March 31, 2019, respectively; aggregate liquidation preference of $572,866 and $574,277 at December 31, 2018 and March 31, 2019, respectively, no aggregate liquidation preference, no shares issued and outstanding at March 31, 2019 unaudited pro forma	560,858	561,210	—
Shareholders' (deficit) equity			
Common stock: $0.0001 par value, 131,000,000 shares authorized at December 31, 2018 and March 31, 2019, respectively; 12,841,536 and 12,930,536 shares issued and outstanding at December 31, 2018 and March 31, 2019, respectively, 105,974,230 shares issued and outstanding at March 31, 2019 unaudited pro forma	1	1	11
Additional paid-in capital	37,902	40,981	602,543
Accumulated other comprehensive (loss) gain	(107)	92	92
Accumulated deficit	(295,908)	(314,548)	(314,548)
Total shareholders' (deficit) equity	(258,112)	(273,474)	288,098
Total liabilities, convertible preferred stock and shareholders' (deficit) equity	$ 332,688	$ 614,575	$ 614,584

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Condensed Statements of Operations

(in thousands, except share and per share amounts)

	Three Months Ended March 31,	
	2018 (unaudited)	2019 (unaudited)
Revenue		
Sequencing revenue	$ 5,780	$ 6,083
Development revenue	3,935	6,583
Total revenue	9,715	12,666
Operating expenses		
Cost of revenue	3,989	4,988
Research and development	8,855	12,483
Sales and marketing	5,047	7,817
General and administrative	4,543	7,004
Amortization of intangible assets	419	419
Total operating expenses	22,853	32,711
Loss from operations	(13,138)	(20,045)
Interest and other income, net	747	1,659
Net loss	(12,391)	(18,386)
Fair value adjustment to Series E-1 convertible preferred stock options	4	(254)
Net loss attributable to common shareholders	$ (12,387)	$ (18,640)
Net loss per share attributable to common shareholders, basic and diluted	$ (1.01)	$ (1.45)
Weighted-average shares used in computing net loss per share attributable to common shareholders, basic and diluted	12,292,563	12,886,087
Unaudited pro forma net loss per share attributable to common shareholders, basic and diluted		$ (0.18)
Unaudited weighted-average shares used in computing pro forma net loss per share attributable to common shareholders, basic and diluted		105,880,665

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Condensed Statements of Comprehensive Loss

(in thousands)

	Three Months Ended March 31,	
	2018 (unaudited)	2019 (unaudited)
Net loss	$ (12,391)	$ (18,386)
Change in unrealized (loss) gain on investments	(117)	199
Comprehensive loss	$ (12,508)	$ (18,187)

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Condensed Statements of Convertible Preferred Stock and Shareholders' (Deficit) Equity
(in thousands, except share amounts)

	Convertible preferred stock		Common stock		Additional paid-In capital	Accumulated other comprehensive (loss) income	Accumulated deficit	Total shareholders' (deficit) equity
	Shares	Amount	Shares	Amount				
Balance as of December 31, 2017	92,656,029	$ 561,333	12,208,731	$ 1	$ 24,972	$ (166)	$ (249,423)	$ (224,616)
Adjustments to accumulated deficit for adoption of guidance on accounting for share-based payment transactions (unaudited)	—	—	—	—	140	—	(140)	—
Issuance of common stock for cash upon exercise of stock options (unaudited)	—	—	93,113	—	408	—	—	408
Issuance of Series E-1 convertible preferred stock for cash upon exercise of Series E-1 convertible preferred stock options at fair value (unaudited)	89,705	65	—	—	—	—	—	—
Series E-1 convertible preferred stock option share-based compensation (unaudited)	—	—	—	—	2	—	—	2
Adjustment to redemption value for vested Series E-1 convertible preferred stock options (unaudited)	—	2	—	—	(2)	—	—	(2)
Change in redemption value for vested Series E-1 convertible preferred stock options (unaudited)	—	(4)	—	—	—	—	4	4
Common stock option share-based compensation (unaudited)	—	—	—	—	3,100	—	—	3,100
Other comprehensive loss (unaudited)	—	—	—	—	—	(117)	—	(117)
Net loss (unaudited)	—	—	—	—	—	—	(12,391)	(12,391)
Balance as of March 31, 2018 (unaudited)	92,745,734	$ 561,396	12,301,844	$ 1	$ 28,620	$ (283)	$ (261,950)	$ (233,612)
Balance as of December 31, 2018	92,790,094	$ 560,858	12,841,536	$ 1	$ 37,902	$ (107)	$ (295,908)	$ (258,112)
Issuance of common stock for cash upon exercise of stock options (unaudited)	—	—	89,000	—	33	—	—	33
Issuance of Series E-1 convertible preferred stock for cash upon exercise of Series E-1 convertible preferred stock options at fair value (unaudited)	233,600	98	—	—	—	—	—	—
Change in redemption value for vested Series E-1 convertible preferred stock options (unaudited)	—	254	—	—	—	—	(254)	(254)
Common stock option share-based compensation (unaudited)	—	—	—	—	3,046	—	—	3,046
Other comprehensive income (unaudited)	—	—	—	—	—	199	—	199
Net loss (unaudited)	—	—	—	—	—	—	(18,386)	(18,386)
Balance as of March 31, 2019 (unaudited)	93,023,694	$ 561,210	12,930,536	$ 1	$ 40,981	$ 92	$ (314,548)	$ (273,474)
Pro-forma conversion of convertible preferred stock into common stock (unaudited)	(93,023,694)	(561,210)	93,023,694	10	561,200	—	—	561,210
Pro-forma conversion of convertible preferred stock warrants to common stock warrant and exercise of 20,000 common stock warrants into common stock (unaudited)	—	—	20,000	—	362	—	—	362
Pro-forma balance as of March 31, 2019 (unaudited)	—	$ —	105,974,230	$ 11	$ 602,543	$ 92	$ (314,548)	$ 288,098

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Condensed Statements of Cash Flows

(in thousands)

	Three Months Ended March 31,	
	2018 (unaudited)	2019 (unaudited)
Operating activities		
Net loss	$ (12,391)	$ (18,386)
Adjustments to reconcile net loss to net cash (used in) provided by operating activities:		
Depreciation expense	1,032	1,364
Share-based compensation expense	3,102	3,046
Intangible assets amortization	419	419
Investment amortization	(163)	(618)
Loss (gain) on equipment disposals	1	—
Fair value adjustment of convertible preferred stock warrant	—	18
Other	1	—
Changes in operating assets and liabilities:		
Accounts receivable, net	2,212	741
Inventory	(1,975)	(17)
Prepaid expenses and other current assets	87	(3,732)
Accounts payable and accrued liabilities	(2,388)	(377)
Deferred rent	(197)	(235)
Deferred revenue	4,163	296,080
Net cash (used in) provided by operating activities	(6,097)	278,303
Investing activities		
Purchases of property and equipment	(594)	(3,831)
Purchases of marketable securities	(81,310)	(270,860)
Proceeds from sales and maturities of marketable securities	45,216	52,515
Net cash used in investing activities	(36,688)	(222,176)
Financing activities		
Proceeds from exercise of stock options	473	130
Other	(6)	(6)
Net cash provided by financing activities	467	124
Net (decrease) increase in cash, cash equivalents and restricted cash	(42,318)	56,251
Cash, cash equivalents and restricted cash at beginning of year	85,366	55,091
Cash, cash equivalents and restricted cash at end of year	$ 43,048	$ 111,342
Non-cash investing and financing activities		
Purchases of equipment included in accounts payable and accrued liabilities	$ 92	$ 423
Deferred offering costs included in accounts payable and accrued expenses	$ —	$ 1,825

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

1. Organization and Description of Business

Adaptive Biotechnologies Corporation ("we," "us" or "our") is a commercial-stage company advancing the field of immune-driven medicine by harnessing the inherent biology of the adaptive immune system to transform the diagnosis and treatment of disease. We believe the adaptive immune system is nature's most finely tuned diagnostic and therapeutic for most diseases, but the inability to decode it has prevented the medical community from fully leveraging its capabilities. Our immune medicine platform is the foundation for our expanding suite of products and services. The cornerstone of our immune medicine platform and core immunosequencing product, immunoSEQ, serves as our underlying research and development engine and generates revenue from academic and biopharmaceutical customers. Our first clinical diagnostic product, clonoSEQ, is the first test authorized by the FDA for the detection and monitoring of minimal residual disease ("MRD") in patients with select blood cancers.

We were incorporated in the State of Washington on September 8, 2009 under the name Adaptive TCR Corporation. On December 21, 2011, we changed our name to Adaptive Biotechnologies Corporation. We are headquartered in Seattle, Washington.

2. Significant Accounting Policies

Basis of Presentation and Use of Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles ("U.S. GAAP") requires management to make certain estimates, judgments and assumptions that affect the reported amounts of assets and liabilities and the related disclosures at the date of the financial statements, as well as the reported amounts of revenues and expenses during the periods presented. We base our estimates on historical experience and other relevant assumptions that we believe to be reasonable under the circumstances. Estimates are used in several areas including, but not limited to, estimates of progress to date for certain performance obligations and the transaction price for certain contracts with customers, share-based compensation including the fair value of stock, and the provision for income taxes, including related reserves, and goodwill, among others. These estimates generally involve complex issues and require judgments, involve the analysis of historical results and prediction of future trends, can require extended periods of time to resolve and are subject to change from period to period. Actual results may differ materially from management's estimates.

Unaudited Interim Condensed Financial Statements

The accompanying condensed balance sheet as of March 31, 2019, the condensed statements of operations and comprehensive loss for the three months ended March 31, 2018 and 2019, the condensed statements of convertible preferred stock and shareholders' (deficit) equity as of March 31, 2018 and 2019, the condensed cash flows for the three months ended March 31, 2018 and 2019, and the related interim condensed disclosures are unaudited. In our opinion, the accompanying unaudited condensed financial statements have been prepared in accordance with U.S. GAAP for interim financial information. These unaudited condensed financial statements include all adjustments necessary to fairly state the financial position and the results of our operations and cash flows for interim periods in accordance with U.S. GAAP. Interim-period results are not necessarily indicative of results of operations or cash flows for a full year or any subsequent interim period.

The accompanying condensed financial statements should be read in conjunction with our audited financial statements and notes included elsewhere in this prospectus.

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

Cash and Cash Equivalents

Cash and cash equivalents are stated at fair value. Cash equivalents include only securities having an original maturity of three months or less at the time of purchase. We limit our credit risk associated with cash and cash equivalents by placing our investments with banks that we believe are highly creditworthy and with highly rated money market funds. Cash and cash equivalents primarily consist of bank deposits, investments in money market funds and commercial paper.

Concentrations of Risk

We are subject to a concentration of risk from a limited number of suppliers, or in some cases, single suppliers for some of our laboratory instruments and materials. This risk is managed by targeting a quantity of surplus stock.

Cash, cash equivalents and marketable securities are financial instruments that potentially subject us to concentrations of credit risk. We invest in money market funds, U.S. government debt securities, U.S. government agency bonds, commercial paper and corporate bonds with high-quality accredited financial institutions.

Significant customers are those which represent more than 10% of our total revenue or accounts receivable balance at each respective balance sheet date. Revenue from these customers reflects their purchase of our products and services and we do not believe their loss would have a material adverse effect on our business.

For each significant customer, revenue as a percentage of total revenue and accounts receivable as a percentage of total accounts receivable were as follows:

	Revenue		Accounts Receivable	
	For the Three Months Ended March 31,			
	2018	2019	December 31, 2018	March 31, 2019
	(unaudited)			(unaudited)
Customer A	27.4%	*%	*%	*%
Customer B	*	*	15.1	*
Customer C	10.1	*	13.2	*
Genentech, Inc.	*	49.8	*	*

* less than 10%

Revenue Recognition

We recognize revenue in accordance with Accounting Standards Codification (“ASC”) Topic 606 (“ASC 606”)*, Revenue from Contracts with Customers.* Under ASC 606, for all revenue-generating contracts, we perform the following steps to determine the amount of revenue to be recognized: (i) identification of the contract or contracts; (ii) determination of whether the promised goods or services are performance obligations, including whether they are distinct in the context of the contract; (iii) measurement of the transaction price, including the constraint on variable consideration; (iv) allocation of the transaction price to the performance obligations based on estimated selling prices; and (v) recognition of revenue when (or as) we satisfy each performance obligation. The following is a summary of the application of the respective model to each of our revenue classifications.

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

Overview

Our revenue is generated from immunosequencing ("sequencing") products and services ("sequencing revenue") and from regulatory or development support services leveraging our immune medicine platform ("development revenue"). When revenue generating contracts have elements of both sequencing revenue and development revenue, we allocate revenue based on the nature of the performance obligation and the allocated transaction price.

Sequencing Revenue

Sequencing revenue reflects the amounts generated from providing sequencing services and testing through our immunoSEQ and clonoSEQ products and services to our research and clinical customers, respectively.

For research customers, contracts typically include an amount billed in advance of services ("upfront"), and subsequent billings as sample results are delivered to the customer. Upfront amounts received are recorded as deferred revenue, which we recognize as revenue upon satisfaction of performance obligations. We have identified two typical performance obligations under the terms of our research service contracts: sequencing services and related data analysis. We recognize revenue for both identified performance obligations as sample results are delivered to the customer.

For other research customers who choose to purchase a research use only kit, the kits are sold on a price per kit basis with amounts payable upon delivery of the kit. Payments received are recorded as deferred revenue. For these customers we have identified one performance obligation: the delivery of sample results. We recognize revenue as the results are delivered to the customer based on a proportion of the estimated samples that can be reported on for each kit.

For clinical customers, we derive revenues from providing our clonoSEQ test report to ordering physicians, and we bill and receive payments from commercial third-party payors and medical institutions. In these transactions, we have identified one performance obligation: the delivery of a clonoSEQ report. As payment from the respective payors may vary based on the various reimbursement rates and patient responsibilities, we consider the transaction price to be variable and record an estimate of the transaction price, subject to the constraint for variable consideration, as revenue at the time of delivery. The estimate of transaction price is based on historical reimbursement rates with the various payors, which are monitored in subsequent periods and adjusted as necessary based on actual collection experience.

In January 2019, clonoSEQ received Medicare coverage aligned with the FDA label and NCCN guidelines for longitudinal monitoring in MM and ALL. We bill Medicare for an episode of treatment when we deliver the first eligible test results. This billing contemplates all necessary tests required during a patient's treatment cycle, which is currently estimated at approximately four tests per patient, including the initial sequence identification test. Revenue is recognized at the time the initial billable test result is delivered and is based upon cumulative tests delivered to date. As of March 31, 2019, we recognized $0.5 million relating to the coverage policy; $0.4 million of this revenue was related to tests delivered in periods prior to the three months ended March 31, 2019. Any unrecognized revenue from the initial billable test is recorded as deferred revenue, and is recognized as we deliver the remaining tests in a patient's treatment cycle.

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

Development Revenue

We derive revenue by providing services through development agreements to biopharmaceutical customers who seek access to our immune medicine platform technologies. We generate revenues from the delivery of professional support activities pertaining to the use of our proprietary immunoSEQ and clonoSEQ services in the development of the respective customers' initiatives. The transaction price for these contracts may consist of a combination of non-refundable upfront fees, separately priced sequencing fees, progress based milestones and regulatory milestones. The development agreements may include single or multiple performance obligations depending on the contract. For certain contracts, we may perform services to support the biopharmaceutical customers' regulatory submission as part of their registrational trials. These services include regulatory support pertaining to our technology intended to be utilized as part of the submission, development of analytical plans for our sequencing data, participation on joint research committees and assistance in completing a regulatory submission. Generally, these services are not distinct within the context of the contract, and they are accounted for as a single performance obligation.

When sequencing services are separately priced customer options, we assess if a material right exists and, if not, the customer option to purchase additional sequencing services is not considered part of the contract. Except for any non-refundable upfront fees, the other forms of compensation represent variable consideration. Variable consideration related to progress based and regulatory milestones is estimated using the most likely amount method where variable consideration is constrained until it is probable that a significant reversal of cumulative revenue recognized will not occur. Progress milestones such as the first sample result delivered or final patient enrollment in a customer trial are customer dependent and are included in the transaction price when the respective milestone is probable of occurring. Milestone payments that are not within our customers' control, such as regulatory approvals, are not consider probable of being achieved until those approvals are received. Determining whether regulatory milestone payments are probable is an area that requires significant judgment. In making this assessment, we evaluate the scientific, clinical, regulatory and other risks that must be managed, as well as the level of effort and investment required to achieve the respective milestone.

The primary method used to estimate standalone selling price for performance obligations is the adjusted market assessment approach. Using this approach, we evaluate the market in which we sell our services and estimate the price that a customer in that market would be willing to pay for our services. We recognize revenue using either an input or output measure of progress that faithfully depicts performance on a contract, depending on the contract. The measure used is dependent on the nature of the service to be provided in each contract. Selecting the measure of progress and estimating progress to date requires significant judgment.

Deferred Offering Costs

Deferred offering costs consist of fees and expenses incurred in connection with the anticipated sale of our common stock in the initial public offering, including the legal, accounting, printing and other initial public offering-related costs. Deferred offering costs of $1.8 million are capitalized and classified within noncurrent assets on the condensed balance sheet as of March 31, 2019.

Adaptive Biotechnologies Corporation
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Unaudited Pro Forma Balance Sheet Information

The unaudited pro forma balance sheet information as of March 31, 2019 assumes: (i) the automatic conversion of all of our outstanding shares of convertible preferred stock at March 31, 2019 into an aggregate of 93,023,694 shares of common stock immediately prior to the closing of this offering; (ii) the issuance of 20,000 shares of our common stock upon the exercise of an outstanding warrant to purchase our common stock, immediately prior to the closing of this offering that would otherwise expire; (iii) the conversion of an outstanding warrant to purchase our convertible preferred stock into a warrant to purchase 56,875 shares of our common stock upon the closing of this offering; and (iv) the filing and effectiveness of our amended and restated articles of incorporation, which will occur immediately prior to the closing of this offering.

Unaudited Pro form Shareholders' (Deficit) Equity

The unaudited pro forma shareholders' equity as of March 31, 2019 assumes the following: (i) the automatic conversion of all of our outstanding shares of preferred stock at March 31, 2019 into an aggregate of 93,023,694 shares of common stock immediately prior to the closing of this offering; (ii) the issuance of 20,000 shares of our common stock upon the exercise of an outstanding warrant to purchase our common stock, immediately prior to the closing of this offering; (iii) the conversion of all outstanding warrants to purchase our preferred stock into warrants to purchase an aggregate of 56,875 shares of our common stock upon the closing of this offering; and (iv) the filing and effectiveness of our amended and restated articles of incorporation, which will occur immediately prior to the closing of this offering.

Net Loss Per Share Attributable to Common Shareholders

We calculate our basic and diluted net loss per share attributable to common shareholders in conformity with the two-class method required for companies with participating securities. We consider our convertible preferred stock to be participating securities. In the event a dividend is declared or paid on common stock, holders of convertible preferred stock are entitled to a share of such dividend in proportion to the holders of common stock on an as-if converted basis. Under the two-class method, basic net loss per share attributable to common shareholders is calculated by dividing the net loss attributable to common shareholders by the weighted-average number of shares of common stock outstanding for the period. Net loss attributable to common shareholders is determined by allocating undistributed earnings between common and preferred shareholders. The diluted net loss per share attributable to common shareholders is computed by giving effect to all potential dilutive common stock equivalents outstanding for the period determined using the treasury stock method. The net loss attributable to common shareholders was not allocated to the convertible preferred stock under the two-class method as the convertible preferred stock does not have a contractual obligation to share in our losses. For purposes of this calculation, convertible preferred stock, common stock warrants and stock options are considered common stock equivalents but have been excluded from the calculation of diluted net loss per share attributable to common shareholders as their effect is anti-dilutive.

Unaudited Pro Forma Net Loss Per Share Attributable to Common Shareholders

We have presented the unaudited pro forma basic and diluted net loss per share attributable to common shareholders for the year ended March 31, 2019, which shows the assumed effect of an initial public offering, including (i) the conversion of all convertible preferred stock into shares of common

stock as if the conversion had occurred as of the later of the beginning of the period or the original date of issuance; and (ii) the issuance of 20,000 shares of common stock upon the assumed exercise of a common stock warrant prior to the completion of an initial public offering. The pro forma net loss per share attributable to common shareholders does not include proceeds to be received from nor does it include shares expected to be sold in the assumed initial public offering.

Recent Adopted Accounting Pronouncements

In March 2016, the FASB issued ASU No. 2016-09, *Compensation—Stock Compensation* (Topic 718), intended to simplify the accounting for share-based payment transactions, including the income tax consequences, classification of awards as either equity or liabilities and classification on the statements of cash flows. This guidance also allowed for an entity-wide accounting policy election to either estimate the number of awards that are expected to vest or account for forfeitures as they occur. We adopted this standard as of January 1, 2018 and elected to account for forfeitures as they occur. We utilized a modified retrospective transition method, recorded the cumulative impact of applying this standard, and recognized a cumulative increase to additional paid-in capital and an increase to accumulated deficit of $0.1 million.

In January 2017, the FASB issued ASU No. 2017-04, *Intangibles—Goodwill and Other* (Topic 350): *Simplifying the Test for Goodwill Impairment*, intended to simplify the goodwill impairment test. Under the new guidance, goodwill impairment is measured by the amount by which the carrying value of a reporting unit exceeds its fair value, without exceeding the carrying amount of goodwill allocated to that reporting unit. This guidance is effective January 1, 2022 and is required to be adopted on a prospective basis, with early adoption permitted. We adopted this standard as of January 1, 2018 and this guidance did not have any impact on our financial statements.

In June 2018, the FASB issued ASU 2018-07, *Compensation—Stock Compensation* (Topic 718): *Improvements to Nonemployee Share-Based Payment Accounting*, which expands the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees. The new guidance is effective for us beginning in 2019, with early adoption permitted. We adopted the new guidance effective January 1, 2019 and the adoption did not have any impact on our financial statements or disclosures.

New Accounting Pronouncements Not Yet Adopted

In February 2016, the FASB issued ASU No. 2016-02, *Leases* (Topic 842), intended to increase transparency and comparability among organizations by recognizing lease assets and lease liabilities on the balance sheets and disclosing key information about leasing arrangements. This guidance is effective for us in fiscal years, and interim periods within those fiscal years, beginning after December 15, 2019. Although we are currently evaluating the impact that adopting this guidance will have on our financial statements, we believe the most significant changes will be related to the recognition of the right-of-use assets and related lease liabilities related to our operating leases on the balance sheets.

In June 2016, the FASB issued ASU 2016-13, *Financial Instruments—Credit Losses* (Topic 326): *Measurement of Credit Losses on Financial Instruments*, which amends the impairment model by requiring entities to use a forward-looking approach based on expected losses to estimate credit losses

on certain types of financial instruments, including trade receivables and available-for-sale debt securities. The new guidance is effective for us beginning in 2020, with early adoption permitted. We are currently evaluating the impact that adopting this guidance prospectively will have on our financial statements and do not believe that the adoption will have a material impact.

In August 2018, the FASB issued ASU No. 2018-15, *Intangibles—Goodwill and Other: Internal-Use Software* (Subtopic 350-40), to provide additional guidance on the accounting for costs of implementation activities performed in a cloud computing arrangement. This guidance is effective for fiscal years beginning after December 15, 2019 and early adoption of the amendments in this update are permitted. The adoption of this guidance is not expected to have a material impact on our financial statements.

3. Revenue

Translational Development Agreements

On December 18, 2015, we entered into a translational development agreement with a biopharmaceutical customer for access to certain of our oncology immunosequencing research datasets, including full-time employee support, to accelerate the customer's preclinical, nonclinical and clinical trial testing. Under the initial terms of the agreement we could be entitled to up to $40.0 million over a period of four years which does not include any separately negotiated research sequencing contracts. If the biopharmaceutical customer terminates the agreement prior to the end of the initial four-year research term for any reason other than a material uncured breach by us, then the biopharmaceutical partner has agreed to pay us $0.8 million. In May 2019, the agreement was subsequently amended to reduce the services provided, which in turn reduced the fourth year of eligible payments to $2.3 million.

We identified one performance obligation under this agreement, as the services were determined to be highly interrelated. We determined that any separately negotiated sequencing contracts are not performance obligations under the contract as the contract did not contain any material rights related to such sequencing contracts. For the identified performance obligation, we assessed the work to be performed over the duration of the contract and determined that it is a consistent level of support throughout the period, and therefore revenue has been recognized straight line over the contract term.

Revenue recognized from this translational development agreement, excluding separately negotiated research sequencing contracts, was $2.5 million in the three months ended March 31, 2018. No development revenue was recognized during the three months ended March 31, 2019.

In 2017, we entered into an agreement with a customer to provide services to accelerate its research initiatives. We identified one performance obligation under the agreement, as the services were determined to be highly interrelated. We determined that any separately negotiated sequencing contracts are not performance obligations under the contract, as the contract did not contain any material rights related to such sequencing contracts. Revenue recognized from this agreement, excluding sequencing revenue, was $0.1 million in the three months ended March 31, 2018 and 2019, respectively.

MRD Development Agreements

In 2017 and 2018, we entered into agreements with biopharmaceutical customers to further develop and commercialize clonoSEQ and the biopharmaceutical customers' therapeutics. Under each

of the agreements, we received or will receive non-refundable upfront payments and could receive substantial additional payments upon reaching certain progress milestones or achievement of certain regulatory milestones pertaining to the customers' therapeutic and our clonoSEQ test.

Under the contracts, we identify performance obligations, which may include: (i) obligations to provide services supporting the customer's regulatory submission activities as they relate to our clonoSEQ test; and (ii) sequencing services for customer-provided samples for their regulatory submissions. The transaction price allocated to the respective performance obligations is estimated using an adjusted market assessment approach for the regulatory support services and a standalone selling price for the estimated immunosequencing services. At contract inception we fully constrained any consideration related to the regulatory milestones, as the achievement of such milestones is subject to third-party regulatory approval and the customers' own submission decision-making. We recognize revenue relating to the sequencing services over time using an output method based on the proportion of sample results delivered relative to the total amount of sample results expected to be delivered and when expected to be a faithful depiction of progress. We use the same method to recognize the regulatory support services. When an output method based on the proportion of sample results delivered is not expected to be a faithful depiction of progress, we utilize an input method based on estimates of effort completed using a cost-based model.

We recognized $1.3 million and $0.3 million in development revenue related to these contracts in the three months ended March 31, 2018 and 2019, respectively.

As of March 31, 2019, in future periods we could receive up to an additional $104.5 million in milestone payments if certain regulatory approvals are obtained by our customers' therapeutics in connection with MRD data generated from our clonoSEQ test.

Genentech Collaboration Agreement

In December 2018, we entered into a collaboration with Genentech to leverage our capability to develop cellular therapies in oncology. Subsequent to receipt of regulatory approval in January 2019, we received a non-refundable upfront payment of $300.0 million in February 2019 and may be eligible to receive more than $1.8 billion over time, including payments of up to $75.0 million upon the achievement of specified regulatory milestones, up to $300.0 million upon the achievement of specified development milestones and up to $1,430.0 million upon the achievement of specified commercial milestones. In addition, we are separately able to receive tiered royalties at a rate ranging from the mid-single digits to the mid-teens on aggregate worldwide net sales products arising from the strategic collaboration, subject to certain reductions, with aggregate minimum floors. Under the agreement, we are pursuing two product development pathways for novel T cell immunotherapies in which Genentech intends to use TCRs screened by our immune medicine platform to engineer and manufacture cellular medicines:

- Shared Products. The shared products will use "off-the-shelf" TCRs identified against cancer antigens shared among patients ("Shared Products").
- Personalized Product. The personalized product will use patient-specific TCRs identified by real-time screening of TCRs against cancer antigens in each patient ("Personalized Product").

Under the terms of the agreement, we granted Genentech exclusive worldwide licenses to develop and commercialize TCR-based cellular therapies in the field of oncology including licenses to existing

shared antigen data packages. Additionally, Genentech has the right to determine which product candidates to further develop for commercialization purposes. We determined that this arrangement meets the criteria set forth in ASC Topic 808, *Collaborative Arrangements* ("ASC 808"), because both parties are active participants in the activity and are exposed to significant risks and rewards depending on the activity's commercial failure or success. Because ASC 808 does not provide guidance on how to account for the activities under a collaborative arrangement, we applied the guidance in ASC 606 to account for the activities related to the Genentech collaboration.

In applying ASC 606, we identified the following performance obligations at the inception of the agreement:

1. License to utilize on an exclusive basis all TCR-specific platform intellectual property to develop and commercialize any licensed products in the field of oncology.
2. License to utilize all data and information within each shared antigen data package and any other know-how disclosed by us to Genentech in oncology.
3. License to utilize all private antigen TCR product data in connection with research and development activities in the field of use.
4. License to existing shared antigen data packages.
5. Research and development services for shared product development including expansion of shared antigen data packages.
6. Research and development services for private product development.
7. Obligations to participate on various joint research, development and project committees.

We determined that none of the licenses, research and development services or obligations to participate on various committees were distinct within the context of the contract given such rights and activities were highly interrelated and there was substantial additional research and development to further develop the licenses. We considered factors such as the stage of development of the respective existing antigen data packages, the subsequent development that would be required to both identify and submit a potential target for IND acceptance under both product pathways and the variability in research and development pathways given Genentech's control of product commercialization. Specifically, under the agreement, Genentech is not required to pursue development or commercialization activities pertaining to both product pathways and may choose to proceed with one or the other as opposed to both. Accordingly, we determined that all of the identified performance obligations were attributable to one general performance obligation, which is to further the development of our TCR-specific platform, including data packages, and continue to make our TCR identification process available to Genentech to pursue either product pathway.

Separately, we have a responsibility to Genentech to enter into a supply and manufacturing agreement for patient specific TCRs as it pertains to any Personalized Product therapeutic. We determined this was an option right of Genentech should they pursue commercialization of a Personalized Product therapy. Because of the uncertainty as a result of the early stage of development, the novel approach of our collaboration with Genentech and our rights to future commercial milestones and royalty payments, we determined that this option right was not a material right that should be accounted for at inception. As such, we will account for the supply and manufacturing agreement when entered into between the parties.

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We determined the initial transaction price shall be made up of only the $300.0 million upfront, non-refundable payment as all potential regulatory and development milestone payments were probable of significant revenue reversal as their achievement was highly dependent on factors outside our control. As a result, these payments were fully constrained and were not included in the transaction price as of March 31, 2019. We excluded the commercial milestones and potential royalties from the transaction price as those items relate predominantly to the license rights granted to Genentech and will be assessed when and if such events occur.

As there are potential substantive developments necessary, which Genentech may be able to direct, we determined that we would apply a proportional performance model to recognize revenue for our performance obligation. We measure proportional performance using an input method based on costs incurred relative to the total estimated costs of research and development efforts to pursue both the Shared Product and Personalized Product pathways. We currently expect to recognize the revenue over a period of approximately eight years from the effective date. This estimate of the research and development period considers pursuit options of development activities supporting both the Shared Product and the Personalized Product, but may be reduced or increased based on the various activities as directed by the joint committees, decisions made by Genentech, regulatory feedback or other factors not currently known.

We recognized revenue of approximately $6.3 million for the three months ended March 31, 2019 related to the Genentech collaboration.

4. Fair Value Measurements

The following table sets forth the fair value of financial assets and liabilities that were measured at fair value on a recurring basis (in thousands):

	December 31, 2018			
	Level 1	Level 2	Level 3	Total
Financial assets				
Money market funds	$ 45,998	$ —	$ —	$ 45,998
Commercial paper	—	16,887	—	16,887
U.S. government and agency securities	—	85,623	—	85,623
Corporate bonds	—	7,478	—	7,478
Total financial assets	$ 45,998	$109,988	$ —	$155,986
Financial liabilities				
Convertible preferred stock warrant liability	$ —	$ —	$ 336	$ 336
Total financial liabilities	$ —	$ —	$ 336	$ 336

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	March 31, 2019			
	Level 1	Level 2	Level 3	Total
		(unaudited)		
Financial assets				
Money market funds	$ 66,603	$ —	$ —	$ 66,603
Commercial paper	—	89,985	—	89,985
U.S. government and agency securities	—	259,917	—	259,917
Corporate bonds	—	19,095	—	19,095
Total financial assets	$ 66,603	$368,997	$ —	$435,600
Financial liabilities				
Convertible preferred stock warrant liability	$ —	$ —	$ 353	$ 353
Total financial liabilities	$ —	$ —	$ 353	$ 353

Level 1 securities include highly liquid money market funds, which we measure the fair value based on quoted prices in active markets for identical assets or liabilities. Level 2 securities consist of U.S. government debt securities, U.S. government agency bonds, commercial paper and corporate bonds, and are valued based on recent trades of securities in inactive markets or based on quoted market prices of similar instruments and other significant inputs derived from or corroborated by observable market data. Of the Level 2 commercial paper balance, $39.8 million is recorded as cash and cash equivalents. Level 3 liabilities that are measured at fair value on a recurring basis consist of a convertible preferred stock warrant liability.

The fair value of the convertible preferred stock warrant liability is estimated using the Black-Scholes option-pricing model. Certain inputs were utilized in the option-pricing model as follows:

	December 31, 2018	March 31, 2019 (unaudited)
Fair value estimate	$ 8.27	$ 8.63
Expected term (in years)	2.31	2.06
Risk-free interest rate	2.5%	2.3%
Expected volatility	55.3%	56.2%
Expected dividend yield	—	—

5. Investments

Available-for-sale investments consist of the following as of December 31, 2018 and March 31, 2019 (in thousands):

	December 31, 2018			
	Amortized cost	Unrealized gain	Unrealized loss	Estimated fair value
Short-term marketable securities				
Commercial paper	$ 16,887	$ —	$ —	$ 16,887
U.S. government and agency securities	85,722	—	(99)	85,623
Corporate bonds	7,486	—	(8)	7,478
Total short-term marketable securities	$110,095	$ —	$ (107)	$109,988

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	March 31, 2019			
	Amortized cost	Unrealized gain	Unrealized loss	Estimated fair value
	(unaudited)			
Short-term marketable securities				
Commercial paper	$ 50,138	$ —	$ —	$ 50,138
U.S. government and agency securities	259,816	126	(25)	259,917
Corporate bonds	19,104	—	(9)	19,095
Total short-term marketable securities	$329,058	$ 126	$ (34)	$329,150

The following table presents the gross unrealized holding losses and fair value for investments in an unrealized loss position, and the length of time that individual securities have been in a continuous loss position, as of March 31, 2019 (in thousands):

	Less than 12 months		12 months or greater	
	Fair value	Unrealized loss	Fair value	Unrealized loss
	(unaudited)			
Short-term marketable securities				
U.S. government and agency securities	$31,408	$ (3)	$29,448	$ (22)
Corporate bonds	19,095	(9)	—	—
Total short-term marketable securities	$50,503	$ (12)	$29,448	$ (22)

We evaluated our securities for other-than-temporary impairment and considered the decline in market value for the securities to be primarily attributable to current economic and market conditions. It is not more likely than not that we will be required to sell the securities, and we do not intend to do so prior to the recovery of the amortized cost basis. Based on this analysis, these marketable securities were not considered to be other-than-temporarily impaired as of March 31, 2019.

All the corporate debt, U.S. government and agency securities and commercial paper have an effective maturity date of less than one year.

6. Goodwill and Intangible Assets

There have been no changes in the carrying amount of goodwill since its recognition in 2015.

Intangible assets subject to amortization as of the dates presented consist of the following (in thousands):

	December 31, 2018		
	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
Acquired developed technology	$ 20,000	$ (6,636)	$ 13,364
Purchased intellectual property	325	(63)	262
Balance at December 31, 2018	$ 20,325	$ (6,699)	$ 13,626

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	March 31, 2019		
	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
		(unaudited)	
Acquired developed technology	$ 20,000	$ (7,047)	$ 12,953
Purchased intellectual property	325	(71)	254
Balance at March 31, 2019	$ 20,325	$ (7,118)	$ 13,207

The developed technology was acquired in connection with our acquisition of Sequenta, Inc. in 2015. The remaining balance of the acquired technology and the purchased intellectual property is expected to be amortized over the next eight years.

As of March 31, 2019, expected future amortization expense for intangible assets was as follows (in thousands) (unaudited):

2019	$ 1,279
2020	1,698
2021	1,698
2022	1,698
2023	1,698
Thereafter	5,136
Total future amortization expense	$13,207

7. Deferred Revenue

Deferred revenue by revenue classification was as follows (in thousands):

	December 31, 2018	March 31, 2019
		(unaudited)
Current deferred revenue		
Sequencing	$ 11,238	$ 12,634
Development	1,457	39,390
Total current deferred revenue	12,695	52,024
Non-current deferred revenue		
Sequencing	516	799
Development	188	256,655
Total non-current deferred revenue	704	257,454
Total current and non-current deferred revenue	$ 13,399	$ 309,478

Genentech deferred revenue represents $37.5 million and $256.3 million of the current and non-current development deferred revenue balances, respectively, at March 31, 2019. In general, the current amounts will be recognized as revenue within 12 months and the long-term amounts will be recognized as revenue over a period of approximately eight years. This period of time represents an estimate of the research and development period to develop cellular therapies in oncology which may be reduced or increased based on the various development activities.

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Changes in deferred revenue during the three months ended March 31, 2019 were as follows (in thousands):

Deferred revenue balance at December 31, 2018	$ 13,399
Additions to deferred revenue during the period (unaudited)	301,858
Revenue recognized during the period (unaudited)	(5,779)
Deferred revenue balance at March 31, 2019 (unaudited)	$309,478

As a result of cancelled customer sequencing contracts, we recognized $0.2 million of sequencing revenue during the three months ended March 31, 2019.

8. Commitments and Contingencies

Operating leases

We have entered into various non-cancelable lease agreements for our office and laboratory spaces.

In July 2011, we entered into a non-cancelable lease agreement with a minority shareholder for laboratory and office space in Seattle, Washington. The lease terms were subsequently amended multiple times, most recently in June 2016. The lease terminates in June 2023. The lease also requires us to pay additional amounts for operating and maintenance expenses.

In October 2016, we entered into an agreement to sublease certain laboratory and office space in South San Francisco, California. The lease commenced in October 2016 and terminated in March 2019. The lease requires us to pay additional amounts for operating and maintenance expenses.

In April 2018, we entered into a lease agreement to lease additional space in South San Francisco, California. The lease term is through March 2026 and provides for one five-year option. We will be responsible for our share of allocable operating expenses, tax expenses and utilities cost during the duration of the lease term. In connection with the lease, the landlord funded agreed-upon improvements prior to the lease commencement date of December 12, 2018. The landlord was solely responsible for the $2.4 million cost of such improvements, which we recognized as a leasehold improvement asset that depreciates beginning from the commencement date to the initial lease term, and a corresponding leasehold incentive obligation, which is amortized over the life of the lease.

As of March 31, 2019, future minimum lease payments, exclusive of operating and maintenance costs, are as follows (in thousands) (unaudited):

2019	$ 2,654
2020	3,819
2021	3,917
2022	4,017
2023	2,295
Thereafter	2,315
Total future minimum lease payments	$19,017

Rent expenses, inclusive of operating and maintenance costs, were $0.9 million and $1.2 million for the three months ended March 31, 2018 and 2019, respectively.

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Legal Proceedings

We are subject to claims and assessments from time to time in the ordinary course of business. We will accrue a liability for such matters when it is probable that a liability has been incurred and the amount can be reasonably estimated. When only a range of possible loss can be established, the most probable amount in the range is accrued. If no amount within this range is a better estimate than any other amount within the range, the minimum amount in the range is accrued. We are not currently party to any material legal proceedings.

Indemnification Agreements

In the ordinary course of business, we may provide indemnification of varying scope and terms to vendors, lessors, customers and other parties with respect to certain matters including, but not limited to, losses arising out of breach of such agreements or from intellectual property infringement claims made by third parties. In addition, we have entered into indemnification agreements with members of our Board of Directors and certain of our executive officers that will require us to indemnify them against certain liabilities that may arise by reason of their status or service as directors or officers. The maximum potential amount of future payments that we could be required to make under these indemnification agreements is, in many cases, unlimited. We have not incurred any material costs as a result of such indemnifications and are not currently aware of any indemnification claims.

9. Convertible Preferred Stock

Convertible preferred stock at March 31, 2019 consists of the following (in thousands, except share data) (unaudited):

	Shares authorized	Shares issued and outstanding	Amount	Liquidation preference
Series A	4,550,000	4,550,000	$ 12,405	$ 4,550
Series B	5,645,706	5,645,706	16,017	9,669
Series C	4,804,227	4,747,352	14,425	12,521
Series D	19,269,117	19,269,117	106,905	106,999
Series E	15,524,350	15,524,350	93,698	93,750
Series E-1	17,407,441	16,838,844	72,920[1]	101,688
Series F	21,761,676	21,761,676	195,013	195,100
Series F-1	4,800,000	4,686,649	49,827	50,000
Total convertible preferred stock	93,762,517	93,023,694	$561,210	$574,277

(1) Includes vested Series E-1 convertible preferred stock options of $0.2 million which are not included in the shares issued and outstanding.

10. Shareholders' Deficit

Common Stock

We are authorized to issue 131,000,000 shares of common stock. Our common stock has a par value of $0.0001, no preferences or privileges and is not redeemable. Holders of our common stock are entitled to one vote for each share of common stock held.

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We have reserved shares of common stock for the following as of March 31, 2019 (unaudited):

Shares to be issued upon conversion of all series of convertible preferred stock	93,023,694
Shares to be issued upon exercise of outstanding common stock options	16,851,722
Shares available for future stock option grants	4,780,527
Shares to be issued upon exercise of outstanding Series E-1 convertible preferred stock options	31,077
Shares to be issued upon conversion of Series C convertible preferred stock in connection with warrant exercise	56,875
Shares to be issued upon conversion of common stock warrants	55,032
Shares of common stock reserved for future issuance	114,798,927

Common Stock Warrants

In connection with two transactions in 2012 and 2013, we granted warrants to purchase up to 55,032 shares of common stock. The warrants are exercisable at any time for a period of ten years from the date of issuance at a weighted-average exercise price of $0.37, except in the case of a warrant to purchase 20,000 shares of common stock at an exercise price of $0.45 per share that may expire if unexercised prior to the closing of an initial public offering.

11. Equity Incentive Plans

Adaptive 2009 Equity Incentive Plan

We adopted an equity incentive plan during 2009 (“2009 Plan”) that provides for the issuance of incentive and nonqualified common stock options, and other share-based awards for employees, directors and consultants. Under the 2009 Plan, the option exercise price for incentive and nonqualified stock options may not be less than the fair market value of our common stock at the date of grant as determined by the Board of Directors. Options expire no later than ten years from the grant date, and vesting is established at the time of grant. As of March 31, 2019, we have 21,632,249 shares of common stock available for issuance under the 2009 Plan.

A summary of our option activity during the three months ended March 31, 2019 is as follows:

	Shares available for grant	Shares subject to outstanding options	Weighted-average exercise price per share	Aggregate intrinsic value (in thousands)
Outstanding at December 31, 2018	6,827,996	14,893,253	$ 4.59	$ 39,864
Options granted (unaudited)	(2,150,000)	2,150,000	7.27	
Forfeited or cancelled (unaudited)	102,531	(102,531)	6.38	
Exercised (unaudited)	—	(89,000)	0.37	
Outstanding at March 31, 2019 (unaudited)	4,780,527	16,851,722	4.95	48,090

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

Sequenta, Inc. 2008 Stock Plan, as amended

In connection with our acquisition of Sequenta Inc. in January 2015, we assumed Sequenta's Equity Incentive Plan ("2008 Plan"), including all outstanding options and shares available for future issuance under the 2008 Plan, which are all exercisable for Series E-1 convertible preferred stock.

A summary of our Series E-1 convertible preferred stock option activity during the three months ended March 31, 2019 is as follows:

	Convertible preferred shares subject to outstanding options	Weighted-average exercise price per share	Aggregate intrinsic value (in thousands)
Outstanding at December 31, 2018	264,677	$ 0.44	$ 1,826
Options granted (unaudited)	—	—	
Forfeited or cancelled (unaudited)	—	—	
Exercised (unaudited)	(233,600)	0.42	
Outstanding at March 31, 2019 (unaudited)	31,077	0.60	226

Fair value of options granted

The estimated fair value of options granted during the three months ended March 31, 2018 and 2019 was estimated using the Black-Scholes option-pricing model with the following weighted-average assumptions for our 2009 Plan:

	Adaptive 2009 Equity Incentive Plan	
	Three Months Ended March 31,	
	2018	2019
	(unaudited)	
Grant date fair value	$ 6.55	$ 7.80
Expected term (in years)	6.17	6.04
Risk-free interest rate	2.6%	2.5%
Expected volatility	69.2%	64.4%
Expected dividend yield	—	—

The determination of the fair value of stock options on the date of grant using a Black-Scholes option-pricing model is affected by the estimated fair value of our common stock, as well as assumptions regarding a number of variables that are complex, subjective and generally require significant judgment to determine. The valuation assumptions were determined as follows:

Fair value of common stock—The grant date fair value of our common stock has been determined by our Board of Directors with input from management. The grant date fair value of the common stock was determined using valuation methodologies which utilizes certain assumptions, including probability weighting of events, volatility, time to liquidation, a risk-free interest rate and an assumption for a discount for lack of marketability (Level 3 inputs). In determining the fair value of the common stock, the methodologies used to estimate the enterprise value were performed using methodologies, approaches and assumptions consistent with the *American Institute of Certified Public Accountants Accounting and Valuation Guide, Valuation of Privately-Held-Company Equity Securities Issued as Compensation*.

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

Expected term—The expected life of options granted to employees is determined using the "simplified" method, as illustrated in ASC Topic 718, *Compensation—Stock Compensation*, as we do not have sufficient exercise history to determine a better estimate of expected term. Under this approach, the expected term is presumed to be the average of the weighted-average vesting term and the contractual term of the option.

Risk-free interest rate—We utilize a risk-free interest rate in the option valuation model based on U.S. Treasury zero-coupon issues, with remaining terms similar to the expected term of the options.

Expected volatility—As we do not have any trading history for our common stock, the expected volatility is based on the historical volatility of our publicly traded industry peers utilizing a period of time consistent with our estimate of expected term.

Expected dividend yield—We do not anticipate paying any cash dividends in the foreseeable future and, therefore, use an expected dividend yield of zero in the option valuation model.

Share-based compensation expense of $3.1 million and $3.0 million was recognized during the three months ended March 31, 2018 and 2019, respectively. The compensation costs related to stock options are included in the statements of operations as follows (in thousands):

	Three Months Ended March 31,	
	2018	2019
	(unaudited)	
Cost of revenue	$ 84	$ 130
Research and development	816	917
Sales and marketing	957	906
General and administration	1,245	1,093
Total share-based compensation expense	$ 3,102	$ 3,046

At March 31, 2019, unrecognized share-based compensation expense related to unvested stock options was $25.4 million, which is expected to be recognized over a remaining weighted-average period of 2.99 years.

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

12. Net Loss and Unaudited Pro Forma Net Loss Per Share Attributable to Common Shareholders

Net Loss Per Share

The following table sets forth the computation of the basic and diluted net loss per share attributable to common shareholders (in thousands, except shares and per share amounts):

	Three Months Ended March 31,	
	2018	2019
	(unaudited)	
Net loss	$ (12,391)	$ (18,386)
Fair value adjustments to redemption value for Series E-1 convertible preferred stock options	4	(254)
Net loss attributable to common shareholders, basic and diluted	$ (12,387)	$ (18,640)
Weighted-average shares used in computing net loss per share	12,292,563	12,886,087
Net loss per share attributable to common shareholders, basic and diluted	$ (1.01)	$ (1.45)

Since we were in a loss position for all periods presented, basic net loss per share attributable to common shareholders is the same as diluted net loss per share attributable to common shareholders, as the inclusion of all potential shares of common stock outstanding would have been anti-dilutive. The following weighted-average common stock equivalents were excluded from the calculation of diluted net loss per share attributable to common shareholders for the periods presented as they had an anti- dilutive effect:

	Three Months Ended March 31,	
	2018	2019
	(unaudited)	
Convertible preferred stock (on as if converted basis)	92,743,611	92,974,578
2009 Plan stock options issued and outstanding	13,255,253	16,063,336
2008 Plan stock options issued and outstanding	442,991	137,495
Common stock warrants	55,032	55,032
Convertible preferred stock warrants	56,875	56,875
Total	106,553,762	109,287,316

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

Unaudited Pro Forma Net Loss Per Share

The following table sets forth the computation of the unaudited pro forma basic and diluted net loss per share attributable to common shareholders (in thousands, except shares and per share amounts):

	Three Months Ended March 31, 2019 (unaudited)
Numerator:	
Pro forma net loss attributable to common shareholders, basic and diluted	$ (18,640)
Denominator:	
Weighted-average shares used in computing net loss per share attributable to common shareholders, basic and diluted	12,886,087
Weighted-average shares of common stock issued upon assumed conversion of convertible preferred stock in an IPO	92,974,578
Weighted-average shares of common stock issued upon assumed conversion of a common stock warrant in an IPO	20,000
Weighted-average shares used in computing pro forma net loss per share attributable to common shareholders, basic and diluted	105,880,665
Pro forma net loss per share attributable to common shareholders, basic and diluted	$ (0.18)

13. Subsequent Events

In April and May 2019, the Board of Directors granted, pursuant to our 2009 Plan, stock options to purchase 1,407,181 shares of our common stock to certain employees and 250,000 shares of our common stock to non-employee directors. All options granted have exercise prices of $7.80 per share and are subject to continuing service vesting conditions.

Management has reviewed and evaluated material subsequent events from the condensed balance sheet date of March 31, 2019, through the date the condensed financial statements were available to be issued, May 30, 2019. Other than the matters noted above, no subsequent events have been identified for disclosure.

Shares

Adaptive Biotechnologies Corporation

Common Stock

Goldman Sachs & Co. LLC **J.P. Morgan** **BofA Merrill Lynch**

Cowen **Guggenheim Securities**

William Blair **BTIG**

Through and including , 2019 (the 25th day after the date of this prospectus), all dealers that effect transactions in these securities, whether or not participating in this offering, may be required to deliver a prospectus. This is in addition to the dealers' obligation to deliver a prospectus when acting as underwriters and with respect to their unsold allotments or subscriptions.

PART II

INFORMATION NOT REQUIRED IN PROSPECTUS

Item 13. Other Expenses of Issuance and Distribution

The following is a statement of the costs and expenses, other than the underwriting discounts and commissions, to be incurred by us in connection with the distribution of the securities registered under this registration statement. All amounts are estimated except the SEC registration fee, the FINRA filing fee and The Nasdaq Global Select Market listing fee.

Item	Amount
SEC Registration Fee	$27,876.00
FINRA Filing Fee	35,000.00
The Nasdaq Global Select Market Listing Fee	*
Accounting Fees and Expenses	*
Legal Fees and Expenses	*
Transfer Agent Fees	*
Printing and Engraving Expenses	*
Miscellaneous	*
Total	$ *

* To be completed by amendment.

Item 14. Indemnification of Directors and Officers

RCW 23B.08.320 permits a Washington corporation to, through its articles of corporation, eliminate or limit the personal liability of a director to the corporation or its shareholders for monetary damages for conduct as a director, except for the following:

i. acts or omissions that involve intentional misconduct by a director or a knowing violation of law by a director;

ii. conduct violating RCW 23B.08.310 relating to unlawful distributions;

iii. any transaction from which the director will personally receive a benefit in money, property or services to which the director is not legally entitled; and

iv. any act or omission occurring prior to the date when the provision in the articles of incorporation eliminating or limiting liability becomes effective.

RCW 23B.08.510 authorizes a Washington corporation to indemnify an individual made a party to a proceeding because the individual is or was a director against liability incurred in the proceeding if:

i. the individual acted in good faith; and

ii. the individual reasonably believed (a) in the case of conduct in the individual's official capacity with the corporation, that the individual's conduct was in its best interests, and (b) in all other cases, that the individual's conduct was at least not opposed to its best interests; and

iii. in the case of any criminal proceeding, the individual had no reasonable cause to believe the individual's conduct was unlawful.

Notwithstanding the forgoing, a Washington corporation may not indemnify a director under RCW 23B.08.510 in connection with (a) a proceeding by or on behalf of the corporation in which the director

was adjudged liable to the corporation or (b) any other proceeding charging improper personal benefit to the director, in which the director was adjudged liable on the basis that personal benefit was improperly received by the director. Additionally, where a proceeding is by or on behalf of the corporation, the indemnification permitted under RCW 23B.08.510 is limited to reasonable expenses incurred in connection with the proceeding.

RCW 23B.08.520 mandates a Washington corporation to indemnify a director who was wholly successful, on the merits or otherwise, in the defense of any proceeding to which the director was a party because of being a director of the corporation against reasonable expenses incurred by the director in connection with the proceeding, unless such indemnification is limited in the corporation's articles of incorporation. Our amended and restated articles of incorporation which will be in effect upon the closing of this offering will not contain any such limitation.

RCW 23B.08.540 permits court-ordered indemnification, unless a corporation's articles of incorporation provides otherwise. Pursuant to this provision, in the absence of a contrary provision in a corporation's articles of incorporation, a director who is a party to a proceeding may apply for indemnification or advance of expenses to the court conducting the proceeding or to another court of competent jurisdiction, and such court may order indemnification or advance of expenses if it makes certain determinations.

Under RCW 23B.08.570, unless a corporation's articles of incorporation provide otherwise, an officer of a Washington corporation who is not a director is also entitled to mandatory indemnification under RCW 23B.08.520 and court-ordered indemnification under RCW 23B.08.540, each of which sections are summarized above, to the same extent as a director. Further, a Washington corporation may indemnify an officer, employee or agent of the corporation under RCW 23B.08.510, to the same extent as a director.

RCW 23B.08.580 permits a corporation to purchase and maintain insurance on behalf of any individual who is or was a director, officer, employee or agent of the corporation, or who while a director, officer, employee or agent of the corporation, is or was serving at the corporation's request as a director, officer, partner, trustee, employee or agent of another corporation, partnership, joint venture, trust, employee benefit plan or other enterprise, against liability asserted against or incurred by the individual in that capacity or arising from the individual's status as a director, officer, employee or agent, whether or not the corporation would have power to indemnify such individual against the same liability under RCW 23B.08.510 and 23B.08.520.

Our amended and restated articles of incorporation and our amended and restated bylaws which will be in effect upon the closing of this offering will provide that we will indemnify our directors and officers to the fullest extent permitted under Washington law.

We have entered into indemnification agreements with each of our current directors and executive officers, and may enter into indemnification agreements with future directors and executive officers, to provide such directors and officers, additional contractual assurances regarding the scope of the indemnification set forth in our amended and restated articles of incorporation and our amended and restated bylaws and to provide additional procedural protections.

We may also purchase and maintain liability insurance on behalf of our directors, officers, employees, and agents. We currently maintain a liability insurance policy pursuant to which our directors and officers may be indemnified against liability incurred as a result of serving in their capacities as directors and officers, subject to certain exclusions.

The underwriting agreement, to be filed as Exhibit 1.1 hereto, is expected to provide for indemnification by the underwriters of us and our officers and directors, and by us of the underwriters, against certain liabilities, including liabilities arising under the Securities Act.

Item 15. Recent Sales of Unregistered Securities

The following sets forth information regarding all unregistered securities we have sold since May 1, 2016.

(a) Sales of Preferred Stock

On December 11, 2017 we entered into a Series F-1 Preferred Stock Purchase Agreement, pursuant to which we issued and sold an aggregate of 4,686,649 shares of our Series F-1 convertible preferred stock at a price per share of $10.6686, for an aggregate purchase price of $49,999,984.

No underwriters were involved in the foregoing sales of securities. Unless otherwise stated, the sales of securities described above were deemed to be exempt from registration pursuant to Section 4(a)(2) of the Securities Act, including Regulation D and Rule 506 promulgated thereunder, as transactions by an issuer not involving a public offering. All of the purchasers in these transactions represented to us in connection with their purchase that they were acquiring the securities for investment and not distribution, that they could bear the risks of the investment and could hold the securities for an indefinite period of time. Such purchasers received written disclosures that the securities had not been registered under the Securities Act and that any resale must be made pursuant to a registration or an available exemption from such registration. All of the foregoing securities are deemed restricted securities for the purposes of the Securities Act.

(b) Grants and Exercises of Stock Options

In connection with our Sequenta Acquisition, we assumed stock options to purchase an aggregate of 1,574,045 shares of our Series E-1 convertible preferred stock, which, to the extent such options are outstanding as of the closing of this offering, will each be converted into options to purchase one share of our common stock, with exercise prices ranging from $0.10 to $0.92 per share, to employees, directors and consultants pursuant to our Sequenta Plan. During the period beginning May 31, 2016 and ending May 30, 2019, 567,282 shares of Series E-1 convertible preferred stock were issued upon the exercise of stock options pursuant to our Sequenta Plan, which will each be converted into one share of our common stock upon the closing of this offering.

During the period beginning May 31, 2016 and ending May 30, 2019, we granted stock options to purchase an aggregate of 10,894,552 shares of our common stock, with exercise prices ranging from $6.27 to $7.80 per share, to employees, directors and consultants pursuant to the 2009 Plan. During the period beginning May 31, 2016 and ending May 30, 2019, 1,124,413 shares of common stock were issued upon the exercise of stock options pursuant to the 2009 Plan.

The issuances of the securities described above were exempt from registration pursuant to Section 4(a)(2) of the Securities Act as transactions by an issuer not involving a public offering or Rule 701 promulgated under the Securities Act as transactions pursuant to compensatory benefit plans. The shares of common stock issued upon the exercise of options are deemed to be restricted securities for purposes of the Securities Act.

Item 16. Exhibits and Financial Statement Schedules

(a) Exhibits

Exhibit No.	Exhibit Index
1.1*	Form of Underwriting Agreement
3.1	Amended and Restated Articles of Incorporation of the Registrant, as currently in effect
3.2*	Form of Amended and Restated Articles of Incorporation of the Registrant (to be effective upon the closing of this offering)
3.3	Bylaws of the Registrant, as currently in effect
3.4*	Form of Amended and Restated Bylaws (to be effective upon the closing of this offering)
4.1	Seventh Amended and Restated Investors' Rights Agreement among the Registrant and certain of its shareholders, dated May 30, 2019
4.2	Warrant to Purchase Stock, dated June 5, 2012, issued by the Registrant to Silicon Valley Bank
4.3	Warrant to Purchase Common Stock, dated July 18, 2013, issued by the Registrant to Imdaptive, Inc.
4.4	Warrant to Purchase Stock, dated April 21, 2014, issued by the Registrant to Alexandria Equities, LLC
5.1*	Opinion of DLA Piper LLP (US)
10.1†	Strategic Collaboration and License Agreement between Genentech, Inc. and the Registrant, dated December 19, 2018
10.2†	Strategic Collaboration Agreement between Microsoft Corporation and the Registrant, dated December 11, 2017
10.3†*	Master Terms & Conditions of Sale between Illumina, Inc. and the Registrant, dated , 2019
10.4†	Master Collaboration Agreement between Adaptimmune Limited and the Registrant, dated July 10, 2015
10.5	Amended and Restated Side Letter Agreement among Viking Global Equities LP, Viking Global Equities II LP, VGE III Portfolio Ltd., Viking Long Fund Master Ltd. and the Registrant, dated May 8, 2019
10.6	Master Services Agreement between ZS Associates, Inc. and the Registrant, dated August 5, 2015, as amended by Amendment No. 1, dated April 24, 2017
10.7	Form of Amended and Restated Employment Agreement between the Registrant and certain of its executive officers, to be in effect upon the effectiveness of this Registration Statement
10.8	Form of Amended and Restated Employment Agreement between the Registrant and each of Lance Baldo, MD and Francis T. Lo
10.9	Form of Restated Non-Employee Director Change in Control Agreement between the Registrant and each of its non-employee directors, to be in effect upon the effectiveness of this Registration Statement
10.10	Executive Severance Agreement between the Registrant and Chad Cohen, dated May 1, 2019
10.11	Executive Severance Agreement between the Registrant and Lance Baldo, MD, dated April 22, 2019
10.12	Executive Severance Agreement between the Registrant and Charles Sang, dated May 1, 2019
10.13	Form of Indemnification Agreement between the Registrant and each of its directors and executive officers
10.14*	Adaptive Biotechnologies Corporation Non-Employee Director Compensation Policy

Exhibit No.	Exhibit Index
10.15	Adaptive Biotechnologies Corporation 2009 Equity Incentive Plan and form of award agreement thereunder
10.16*	Adaptive Biotechnologies Corporation 2019 Equity Incentive Plan and forms of award agreements thereunder
10.17*	Adaptive Biotechnologies Corporation 2019 Employee Stock Purchase Plan
10.18	Lease Agreement between ARE-Seattle No. 11, LLC and Adaptive TCR Corporation, dated July 21, 2011, as amended by Amendment No. 1, dated August 26, 2011, Amendment No. 2, dated June 30, 2014, Amendment No. 3, dated November 5, 2015, Amendment No. 4, dated December 23, 2015, and Amendment No. 5, dated June 6, 2016
23.1	Consent of Independent Registered Public Accounting Firm
23.2*	Consent of DLA Piper LLP (US) (included in Exhibit 5.1)
24.1	Power of Attorney (included on the signature page hereto)

* To be filed by amendment.

† Portions of this exhibit have been omitted pursuant to Item 601 of Regulation S-K promulgated under the Securities Act because the information is not material and would be competitively harmful if publicly disclosed.

(b) Financial statement schedules. Schedules not listed above have been omitted because the information required to be set forth therein is not applicable or is shown either in the financial statements or the notes thereto.

Item 17. Undertakings

The undersigned registrant hereby undertakes to provide to the underwriter at the closing specified in the underwriting agreement certificates in such denominations and registered in such names as required by the underwriter to permit prompt delivery to each purchaser.

The undersigned registrant hereby undertakes that:

(1) For purposes of determining any liability under the Securities Act, the information omitted from the form of prospectus filed as part of this registration statement in reliance upon Rule 430A and contained in a form of prospectus filed by the registrant pursuant to Rule 424(b) (1) or (4) or 497(h) under the Securities Act shall be deemed to be part of this registration statement as of the time it was declared effective.

(2) For the purpose of determining any liability under the Securities Act, each post-effective amendment that contains a form of prospectus shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the registrant pursuant to the foregoing provisions, or otherwise, the registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Securities Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the registrant of expenses incurred or paid by a director, officer or controlling person of the registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Securities Act and will be governed by the final adjudication of such issue.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, the registrant has duly caused this registration statement to be signed on its behalf by the undersigned, in the city of Seattle, State of Washington, on May 30, 2019.

Adaptive Biotechnologies Corporation

By: /s/ Chad Robins
Chad Robins
Chief Executive Officer

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose individual signature appears below hereby authorizes and appoints Chad Robins and Chad Cohen, and each of them, with full power of substitution and resubstitution and full power to act without the other, as his true and lawful attorney-in-fact and agent to act in his name, place and stead and to execute in the name and on behalf of each person, individually and in each capacity stated below, and to file any and all amendments to this registration statement on Form S-1, and to file the same, with all exhibits thereto, and all other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing, ratifying and confirming all that said attorneys-in-fact and agents or any of them or their or his substitute or substitutes may lawfully do or cause to be done by virtue thereof.

Pursuant to the requirements of the Securities Act of 1933, this registration statement has been signed below by the following persons in the capacities and on the dates indicated.

Signature	Title	Date
/s/ Chad Robins Chad Robins	Chief Executive Officer and Director *(Principal Executive Officer)*	May 30, 2019
/s/ Chad Cohen Chad Cohen	Chief Financial Officer *(Principal Financial and Accounting Officer)*	May 30, 2019
/s/ Kevin Conroy Kevin Conroy	Director	May 30, 2019
/s/ Eric Dobmeier Eric Dobmeier	Director	May 30, 2019
/s/ David Goel David Goel	Director	May 30, 2019
/s/ Michelle Griffin Michelle Griffin	Director	May 30, 2019
/s/ Robert Hershberg Robert Hershberg, PhD, MD	Director	May 30, 2019

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Signature	Title	Date
/s/ Peter Neupert Peter Neupert	Director	May 30, 2019
/s/ Michael Pellini Michael Pellini, MD	Director	May 30, 2019
/s/ Andris Zoltners Andris Zoltners, PhD	Director	May 30, 2019

Exhibit 3.1

CERTIFICATE OF OFFICER REGARDING
AMENDED AND RESTATED ARTICLES OF INCORPORATION
OF
ADAPTIVE BIOTECHNOLOGIES CORPORATION

Adaptive Biotechnologies Corporation, a Washington corporation, by Chad M. Robins, its duly elected and qualified Chief Executive Officer, hereby delivers to the Secretary of State of the State of Washington for filing Amended and Restated Articles of Incorporation in duplicate, pursuant to RCW 23B.10.

1. The name of the corporation is Adaptive Biotechnologies Corporation.

2. The Articles of Incorporation, as amended, have been amended and restated in their entirety to read as set forth on Exhibit A attached hereto.

3. Such amendments and restatement were adopted by the Board of Directors on April 23, 2019.

4. Such amendments and restatement were duly approved by the shareholders on May 29, 2019 in accordance with the provisions of RCW 23B.10.030, 23B.10.040 and 23B.10.070 of the Washington Business Corporation Act.

5. The Amended and Restated Articles of Incorporation will be effective upon filing.

Dated as of May 30, 2019.

ADAPTIVE BIOTECHNOLOGIES CORPORATION

By /s/ Chad M. Robins
Chad M. Robins
Chief Executive Officer

AMENDED AND RESTATED ARTICLES OF INCORPORATION
OF
ADAPTIVE BIOTECHNOLOGIES CORPORATION

ARTICLE 1

NAME

The name of this corporation is Adaptive Biotechnologies Corporation (the "**Company**").

ARTICLE 2

DURATION

The Company is organized under the Washington Business Corporation Act (the "**Act**") and shall have perpetual existence.

ARTICLE 3

PURPOSE AND POWERS

The purpose and powers of this corporation are as follows:

(a) To engage in any lawful business.

(b) To engage in any and all activities that, in the judgment of the Board of Directors, may at any time be incidental or conducive to the attainment of the foregoing purpose.

(c) To exercise any and all powers that a corporation formed under the Act, or any amendment thereto or substitute therefor, is entitled at the time to exercise.

ARTICLE 4

CAPITAL STOCK

4.1 **Authorized Capital**. The Company shall have authority to issue 224,762,517 shares of stock in the aggregate. Such shares shall be divided into two classes as follows:

(a) 131,000,000 shares of common stock, par value $0.0001 per share (the "**Common Stock**").

(b) 93,762,517 shares of preferred stock, par value $0.0001 per share (the "**Preferred Stock**"). The shares of Preferred Stock may be divided into and issued in series.

4.2 **Common Stock**. Except to the extent rights, preferences, privileges or restrictions are granted to Preferred Stock or any series thereof, or as provided below, Common Stock has unlimited voting rights and is entitled to receive the net assets of the Company upon dissolution. Except to the extent rights, preferences, privileges or restrictions are granted to Preferred Stock or any series thereof, or as provided below, the relative rights, preferences, privileges and restrictions granted to or imposed upon the Common Stock and the holders thereof are as follows:

(a) **Dividend Rights**. The holders of record of outstanding shares of Common Stock shall be entitled to receive, when, as and if declared by the Board of Directors, out of any funds of the Company legally available therefor, such cash and other dividends as may be declared from time to time by the Board of Directors subject, however, to any preferential rights granted to any series of Preferred Stock to first receive such assets and funds.

(b) **Liquidation Rights**. In the event of any liquidation, dissolution or winding up of the affairs of the Company, whether voluntary or involuntary, the holders of issued and outstanding shares of Common Stock shall be entitled to receive with equal priority and on a *pari passu* basis among the holders of Common Stock and Series E-1 Preferred (as defined below) based on the number of shares of Common Stock held by them (on an as-converted to Common Stock basis), all the assets and funds of the Company available for distribution to its shareholders, whether from capital or surplus, subject, however, to any preferential rights granted to any series of Preferred Stock to first receive such assets and funds.

(c) **Voting Rights**. Each holder of Common Stock shall be entitled to one vote for each share of Common Stock held.

4.3 **Preferred Stock**. Authority is vested in the Board of Directors, subject to the limitations and procedures prescribed by law, to divide any part or all of such Preferred Stock into any number of series, to fix and determine relative rights and preferences of the shares of any series to be established, and to amend the rights and preferences of the shares of any series that has been established but is wholly unissued.

Within any limits stated in these Articles, the Board of Directors, after the issuance of shares of a series, may amend the resolution establishing the series to decrease (but not below the number of shares of such series then outstanding) the number of shares of that series, and the number of shares constituting the decrease shall thereafter constitute authorized but undesignated shares.

Unless otherwise expressly provided in the designation of the rights and preferences of a series of Preferred Stock, a distribution in redemption or cancellation of shares of Common Stock or rights to acquire Common Stock held by a former employee

or consultant of the Company or any of its affiliates may, notwithstanding RCW 23B.06.400(2)(b), be made without regard to the preferential rights of holders of shares of that series of Preferred Stock.

4.4 **Designation of Rights and Preferences of Series Preferred.** Four Million Five Hundred Fifty Thousand (4,550,000) shares of Preferred Stock are designated as Series A Preferred Stock (the "**Series A Preferred**"). Except as otherwise provided in these Articles, all shares of Series A Preferred shall be identical and shall entitle the holders thereof to the same rights and privileges. Five Million Six Hundred Forty-Five Thousand Seven Hundred Six (5,645,706) shares of Preferred Stock are designated as Series B Preferred Stock (the "**Series B Preferred**"). Except as otherwise provided in these Articles, all shares of Series B Preferred shall be identical and shall entitle the holders thereof to the same rights and privileges. Four Million Eight Hundred Four Thousand Two Hundred Twenty-Seven (4,804,227) shares of Preferred Stock are designated as Series C Preferred Stock (the "**Series C Preferred**"). Except as otherwise provided in these Articles, all shares of Series C Preferred shall be identical and shall entitle the holders thereof to the same rights and privileges. Nineteen Million Two Hundred Sixty-Nine Thousand One Hundred Seventeen (19,269,117) shares of Preferred Stock are designated as Series D Preferred Stock (the "**Series D Preferred**"). Except as otherwise provided in these Articles, all shares of Series D Preferred shall be identical and shall entitle the holders thereof to the same rights and privileges. Fifteen Million Five Hundred Twenty-Four Thousand Three Hundred Fifty (15,524,350) shares of Preferred Stock are designated as Series E Preferred Stock (the "**Series E Preferred**"). Except as otherwise provided in these Articles, all shares of Series E Preferred shall be identical and shall entitle the holders thereof to the same rights and privileges. Seventeen Million Four Hundred Seven Thousand Four Hundred Forty-One (17,407,441) shares of Preferred Stock are designated as Series E-1 Preferred Stock (the "**Series E-1 Preferred**" and, collectively with the Series A Preferred, Series B Preferred and Series C Preferred, the "**Junior Preferred**"). Except as otherwise provided in these Articles, all shares of Series E-1 Preferred shall be identical and shall entitle the holders thereof to the same rights and privileges. Twenty-One Million Seven Hundred Sixty-One Thousand Six Hundred Seventy-Six (21,761,676) shares of Preferred Stock are designated as Series F Preferred Stock (the "**Series F Preferred**"). Except as otherwise provided in these Articles, all shares of Series F Preferred shall be identical and shall entitle the holders thereof to the same rights and privileges. Four Million Eight Hundred Thousand (4,800,000) shares of Preferred Stock are designated as Series F-1 Preferred Stock (the "**Series F-1 Preferred**", and, collectively with the Series D Preferred, the Series E Preferred and the Series F Preferred, the "**Senior Preferred**"). Except as otherwise provided in these Articles, all shares of Series F-1 Preferred shall be identical and shall entitle the holders thereof to the same rights and privileges. The Junior Preferred and the Senior Preferred are collectively referred to herein as the "**Series Preferred.**" The relative rights, preferences, privileges and restrictions granted to or imposed upon the Series Preferred and the holders thereof are as follows:

(a) **Dividend Rights.**

(i) The Company shall not declare, pay or set aside any

dividends on shares of any other class or series of capital stock of the Company ranking junior to the Series Preferred ("**Junior Stock**") (other than dividends on shares of Common Stock payable in shares of Common Stock) unless the holders of the Series Preferred then outstanding shall first receive, or simultaneously receive, a dividend on each outstanding share of Series Preferred in an amount at least equal to the greater of (A) in the case of the Series F-1 Preferred, $0.8535 per share (as adjusted for any consolidations, combinations, stock distributions, stock dividends, stock splits, reverse splits or similar events (each, a "**Recapitalization Event**")) per year from and after the date of the issuance of each such share of Series F-1 Preferred (to the extent not previously paid), (B) in the case of the Series F Preferred, $0.7172 per share (as adjusted for any Recapitalization Event) per year from and after the date of the issuance of each such share of Series F Preferred (to the extent not previously paid), (C) in the case of the Series E Preferred, $0.4831 per share (as adjusted for any Recapitalization Event) per year from and after the date of the issuance of each such share of Series E Preferred (to the extent not previously paid), (D) in the case of the Series D Preferred, $0.4442 per share (as adjusted for any Recapitalization Event) per year from and after the date of the issuance of each such share of Series D Preferred (to the extent not previously paid), and (E) (1) in the case of a dividend on Common Stock or any other Junior Stock that is convertible into Common Stock, that dividend per share of Series Preferred as would equal the product of (x) the dividend payable on each share of such Junior Stock determined, if applicable, as if all shares of such Junior Stock had been converted into Common Stock and (y) the number of shares of Common Stock issuable upon conversion of such share of Series Preferred, in each case calculated on the record date for determination of holders entitled to receive such dividend or (2) in the case of a dividend on any Junior Stock that is not Common Stock or convertible into Common Stock, at a rate per share of Series Preferred determined by (x) dividing the amount of the dividend payable on each share of such Junior Stock by the original issuance price of such Junior Stock (as adjusted for any Recapitalization Event with respect to such shares) and (y) multiplying such fraction by an amount equal to the applicable Original Issue Price (as defined below); provided that, if the Company declares, pays or sets aside, on the same date, a dividend on shares of more than one class or series of Junior Stock, the dividend payable to the holders of Series Preferred pursuant to this subsection (i) shall be calculated based upon the dividend on the class or series of Junior Stock that would result in the highest dividend per share of Series Preferred. The "**Series A Original Issue Price**" shall mean $1.00 per share, as adjusted for any Recapitalization Event with respect to the Series A Preferred; the "**Series B Original Issue Price**" shall mean $1.7127 per share, as adjusted for any Recapitalization Event with respect to the Series B Preferred; the "**Series C Original Issue Price**" shall mean $2.6374 per share, as adjusted for any Recapitalization Event with respect to the Series C Preferred; the "**Series D Original Issue Price**" shall mean $5.5529 per share, as adjusted for any Recapitalization Event with respect to the Series D Preferred; the "**Series E Original Issue Price**" shall mean $6.0389 per share, as adjusted for any Recapitalization Event with respect to the Series E Preferred; the "**Series E-1 Original Issue Price**" shall mean $6.0389 per share, as adjusted for any Recapitalization Event with respect to the Series E-1 Preferred; the "**Series F Original Issue Price**" shall mean $8.9653 per share, as adjusted for any Recapitalization Event with respect to the Series F Preferred; and the "**Series F-1**

Original Issue Price" shall mean $10.6686 per share, as adjusted for any Recapitalization Event with respect to the Series F-1 Preferred (each, the applicable "**Original Issue Price**" for such series). Notwithstanding the above, each holder of an outstanding share of Series Preferred shall be deemed to have consented to distributions made by the Company in connection with its repurchase of shares of Common Stock issued to or held by officers, directors or employees of, or consultants to, the Company or its subsidiaries upon termination of their employment or services pursuant to agreements (whether now existing or hereafter entered into) providing for the right of repurchase between the Company and such persons upon termination of employment or services.

(ii) Dividends, if any, shall be paid by mailing a check, postage prepaid, or via wire transfer, to the address of each holder (or, in the case of joint holders, to the address of any such holder) of Series Preferred and/or Common Stock, as applicable, as shown on the books of the Company, or to such other address as such holder specifies for such purpose by written notice to the Company. The mailing of such check or wire transfer shall satisfy all obligations of the Company with respect to such dividends, unless such check is not paid upon timely presentation.

(b) **Liquidation Rights.**

(i) In the event of any liquidation, dissolution, or winding up of the Company, whether voluntary or involuntary:

(A) First, the holders of each share of Series F-1 Preferred and Series F Preferred shall be entitled to receive, on a *pari passu* basis, prior and in preference to any distribution of the assets or surplus funds of the Company to the holders of shares of Series E Preferred, Series D Preferred or any series of Junior Preferred or of Junior Stock by reason of their ownership thereof, and subject to the rights of any series of Preferred Stock that ranks on liquidation prior to the Series F-1 Preferred and Series F Preferred, an amount equal to the greater of: (1) an amount per share, as adjusted for any Recapitalization Events, equal to the sum of the applicable Original Issue Price for such share plus any declared but unpaid dividends thereon; or (2) such amount per share as would have been payable had each such share of Series F-1 Preferred or Series F Preferred been converted into Common Stock pursuant to Section 4.4(d) below immediately prior to such liquidation, dissolution, or winding up; provided, that if the assets and surplus funds available for distribution among the holders of Series F-1 Preferred and Series F Preferred shall be insufficient to permit the payment to such holders of the full aforesaid preferential amounts, then the entire assets and surplus funds then remaining legally available for distribution shall be distributed among the holders of the Series F-1 Preferred and Series F Preferred in proportion to the full preferential amount each such holder is otherwise entitled to receive.

(B) Upon the completion of the distributions required by Section 4.4(b)(i)(A) above, the holders of each share of Series E Preferred and Series D Preferred shall be entitled to receive, on a *pari passu* basis, prior and in preference to any distribution of the assets or surplus funds of the Company to the holders of shares of any series of Junior Preferred or of Junior Stock by reason of their ownership thereof, and

subject to the rights of any series of Preferred Stock (other than the Series F-1 Preferred and Series F Preferred) that ranks on liquidation prior to the Series E Preferred and Series D Preferred, an amount equal to the greater of: (1) an amount per share, as adjusted for any Recapitalization Events, equal to the sum of the applicable Original Issue Price for such share plus any declared but unpaid dividends thereon; or (2) such amount per share as would have been payable had each such share been converted into Common Stock pursuant to Section 4.4(d) below immediately prior to such liquidation, dissolution, or winding up; provided, that if the assets and surplus funds available for distribution among the holders of Series E Preferred and Series D Preferred shall be insufficient to permit the payment to such holders of the full aforesaid preferential amounts, then the entire assets and surplus funds then remaining legally available for distribution shall be distributed, on a pari passu basis, among the holders of the Series E Preferred and Series D Preferred in proportion to the full preferential amount each such holder is otherwise entitled to receive.

(C) Upon the completion of the distributions required by Sections 4.4(b)(i)(A) and (B) above, the holders of each share of Series A Preferred, Series B Preferred and Series C Preferred shall be entitled to receive, on a pari passu basis, prior and in preference to any distribution of the assets or surplus funds of the Company to the holders of shares of Series E-1 Preferred Stock or of Junior Stock by reason of their ownership thereof, and subject to the rights of any series of Preferred Stock (other than the Senior Preferred) that ranks on liquidation prior to the Series A Preferred, Series B Preferred and Series C Preferred, an amount equal to the greater of: (1) an amount per share, as adjusted for any Recapitalization Events, equal to the applicable Original Issue Price for such share; or (2) such amount per share as would have been payable had each such share been converted into Common Stock pursuant to Section 4.4(d) below immediately prior to such liquidation, dissolution or winding up; provided, that if the assets and surplus funds available for distribution among the holders of Series A Preferred, Series B Preferred and Series C Preferred shall be insufficient to permit the payment to such holders of the full aforesaid preferential amounts, then the entire assets and surplus funds then remaining legally available for distribution shall be distributed, on a pari passu basis, among the holders of the Series A Preferred, Series B Preferred and Series C Preferred in proportion to the full preferential amount each such holder is otherwise entitled to receive.

(D) Upon the completion of the distributions required by Sections 4.4(b)(i)(A), (B) and (C) above, the remaining assets of the Company available for distribution to shareholders shall be distributed with equal priority and pro rata among the holders of Junior Stock and Series E-1 Preferred Stock on an as-converted basis (not including the Senior Preferred, the Series A Preferred, the Series B Preferred or the Series C Preferred) in accordance with Section 4.2(b) hereof.

(ii) A merger, consolidation, share exchange or reorganization of the Company with or into any other corporation, corporations or other entity (excluding any merger effected exclusively for the purpose of changing the domicile of the corporation), or any other transaction or series of related transactions, in which the shareholders of the Company immediately prior to such reorganization, merger or

consolidation own less than fifty percent (50%) of the voting power of the surviving entity, or a sale, license, conveyance or other disposition of all or substantially all of the assets of the Company (collectively, a "**Corporate Event**") shall be regarded as a liquidation within the meaning of this Section.

(iii) If any of the assets of the Company are to be distributed other than in cash under this Section 4.4(b) or for any purpose, then the value of the assets to be distributed to the holders of Preferred Stock shall be determined in good faith by the Board of Directors. Notwithstanding the above, any securities to be distributed to the shareholders shall be valued as follows:

(A) if traded on a securities exchange, the value shall be deemed to be the average of the closing prices of the securities on such exchange over the 10-trading-day period ending three business days prior to the distribution;

(B) if actively traded over-the-counter, the value shall be deemed to be the average of the closing bid prices over the 10-trading-day period ending three business days prior to the distribution; and

(C) if there is no active public market, the value shall be the fair market value thereof, as determined in good faith by the Board of Directors; provided, however, that the holders of a majority of the then outstanding shares of Senior Preferred, on an as-converted basis (a "**Senior Preferred Majority**") shall be entitled to dispute the determination of fair market value of any assets or securities (other than securities described in clauses (A) or (B) above) to be distributed to such holder (by notice from the holder to the Board of Directors). Upon delivery of such notice, the Senior Preferred Majority and the Board of Directors shall mutually agree on a nationally recognized investment bank, who shall be engaged to provide a final and conclusive determination of said value as promptly as possible following such engagement; provided, that if the Senior Preferred Majority and the Board of Directors are unable to reach agreement on a nationally recognized investment bank, then each shall pick a nationally recognized investment bank and the two selected investment banks shall select a third nationally recognized investment bank who shall be engaged to provide a final and conclusive determination of said value as promptly as possible following such engagement (the investment bank selected, the "**Arbitrator**"). The Arbitrator's determination will be based primarily on written submissions by the Senior Preferred Majority, on the one hand, and the Board of Directors, on the other hand. The written submissions of the Senior Preferred Majority and the Board of Directors shall be delivered to the Arbitrator within 30 days after the Arbitrator's engagement. The Arbitrator's determination shall be set forth in a written report delivered within 60 days following the Arbitrator's engagement, shall include an explanation of the reasons for its determination and shall be final, binding and conclusive on the parties, absent manifest error. The fees and expenses of the Arbitrator shall be borne by the Company.

(c) **Voting Rights.** Each holder of Series Preferred shall be entitled to vote on all matters submitted to (or required to be submitted to) a vote by shareholders and shall be entitled to that number of votes equal to the total number of shares of

Common Stock into which such holder's shares of Series Preferred are convertible, at the record date for the determination of shareholders entitled to vote or consent on such matter, or, if no such record date is established, at the date on which notice of the meeting of shareholders at which the vote is to be taken is mailed, or the date any written consent of shareholders is first solicited if the action is to be taken by written consent; provided, however, that (w) holders of Series F Preferred, (x) holders of Series E Preferred, (y) holders of Series D Preferred that also hold the Series E Preferred and (z) holders of Series F-1 Preferred that also hold Series E Preferred or Series F Preferred shall not have any right to vote their shares of Series F Preferred, Series E Preferred or, if applicable, Series D Preferred or Series F-1 Preferred (whether at a meeting of corporation shareholders or via written consent) for the election or removal of directors unless and until the earlier to occur of, with respect to a particular holder of Series F Preferred, Series E Preferred or, if applicable, Series D Preferred or Series F-1 Preferred, (i) the filing of all notices and reports as may be required by such holder under the Hart-Scott-Rodino Antitrust Improvements Act of 1976, as amended (15 U.S.C. 18a, the "**HSR Act**") and the expiration or termination of the applicable waiting period under the HSR Act or (ii) the delivery to the corporation of a certification by such holder stating that no filing under the HSR Act is required in order for such holder to have the right to vote its shares of Series F Preferred, Series E Preferred or, if applicable, Series D Preferred or Series F-1 Preferred in the election or removal of directors; provided, further, that following the earlier to occur of (i) or (ii) with respect to a particular holder, such holder shall thereafter automatically and without further action be entitled to vote its shares of Series F Preferred, Series E Preferred or, if applicable, Series D Preferred or Series F-1 Preferred (whether at a meeting of corporation shareholders or via written consent) for the election or removal of directors. Fractional votes will not be permitted, but will be rounded up or down to the nearest whole number with one-half being rounded up based on the aggregate number of shares of Series Preferred held. Except as otherwise expressly provided herein or by the Act, the holders of shares of Series Preferred and Common Stock shall vote together as a single class on all matters.

(d) **Conversion.**

(i) **Right to Convert.** Each share of Series Preferred shall be convertible, at the option of the holder, at any time and from time to time after the date of issuance of such share, at the office of the Company or any transfer agent for the Series Preferred, into one fully paid and nonassessable share of Common Stock (the "**Conversion Ratio**"); provided, that the Conversion Ratio of the shares of Senior Preferred will be subject to adjustment as described in Section 4.4(d)(iv) below, and the Conversion Ratio of all shares of Series Preferred will be subject to adjustment as described in Section 4.4(e) below.

(ii) **Automatic Conversion.** Each share of Series Preferred shall automatically be converted into one fully paid and nonassessable share of Common Stock upon the earlier of (A) the consummation of the Company's sale of its Common Stock in a bona fide, firm commitment underwriting pursuant to a registration statement on Form S–1 under the Securities Act of 1933, as amended, with gross proceeds to the Company of at least $25 million (a "**QPO**"), or (B) (w) in the case of the Series D

Preferred and Series E Preferred, the affirmative vote or written consent of the holders of shares amounting to a majority of the shares of the Series D Preferred and Series E Preferred issued and outstanding, voting together as a single voting group on an as-converted basis, (x) in the case of the Series F-1 Preferred and the Series F Preferred, the affirmative vote or written consent of the holders of shares amounting to a majority of the shares of Series F-1 Preferred and Series F Preferred issued and outstanding, voting together as a single voting group on an as-converted basis, provided, however, that during the Series F-1 Protected Period (as defined below), the shares of Series F-1 Preferred shall not be automatically converted pursuant to this Section 4.4(d)(ii)(B)(x) without the affirmative vote or written consent of the holders of shares amounting to a majority of the shares of Series F-1 Preferred issued and outstanding, (y) in the case of the Series A Preferred, Series B Preferred and Series C Preferred, the affirmative vote or written consent of the holders of shares amounting to a majority of the shares of the Series A Preferred, Series B Preferred and Series C Preferred issued and outstanding, voting together as a single voting group on an as-converted basis or (z) in the case of the Series E-1 Preferred, the affirmative vote or written consent of the holders of shares of Series E-1 Preferred amounting to a majority of the shares of Series E-1 Preferred issued and outstanding on an as-converted basis; provided, that the Conversion Ratio of the shares of Senior Preferred will be subject to adjustment as described in Section 4.4(d)(iv) below, and the Conversion Ratio of all shares of Series Preferred will be subject to adjustment as described in Section 4.4(e) below. Any conversion pursuant to this Section 4.4(d)(ii) shall be effected without any action by the holder of such Series Preferred and whether or not certificates representing such shares are surrendered to the Company or any transfer agent for the Series Preferred.

For purposes of Section 4.4(d)(ii)(B)(x), the "**Series F-1 Protected Period**" shall mean the period beginning upon the execution of a term sheet, letter of intent or other agreement contemplating the consummation of a Specified Corporate Event (as defined below), or the amendment of a term sheet, letter of intent or other agreement regarding a proposed Corporate Event such that the Corporate Event would be a Specified Corporate Event, and ending upon the consummation of such Specified Corporate Event, the cessation of negotiations between the Company and the counter-party thereto with respect to definitive documentation regarding such Specified Corporate Event prior to the execution of such definitive documentation, or, if such definitive documentation is executed, the termination of such definitive documentation prior to the consummation of the Specified Corporate Event contemplated thereby.

For purposes of Section 4.4(d)(ii)(B)(x), a "**Specified Corporate Event**" shall mean a Corporate Event in which the initial consideration to be paid to the Company's shareholders (excluding any consideration payable only upon the satisfaction of post-closing contingencies or placed into escrow or retained as holdback to be available for satisfaction of indemnification or similar obligations in connection with such Corporate Event) would, after giving effect to the automatic conversion of the Series F Preferred and the Series F-1 Preferred pursuant to Section 4.4(d)(ii)(B), result, pursuant to Section 4.4(b), in the holders of shares of Series F Preferred and Series F-1 Preferred receiving, with respect to each share of Series F Preferred and Series F-1 Preferred thus converted, an amount greater than the Series F Original Issue Price but less than the Series F-1 Original Issue Price.

(iii) **Mechanics of Conversion.** Before any holder of Series Preferred shall be entitled to convert the same into shares of Common Stock, such holder shall surrender the certificate or certificates therefor, duly endorsed, at the principal corporate office of the Company or of any transfer agent for the Series Preferred and shall give written notice by mail, postage prepaid, to the Company at its principal corporate office, of the election to convert the same and shall state the name or names in which the certificate or certificates for shares of Common Stock are to be issued; provided, however, that in the event of an automatic conversion pursuant to Section 4.4(d)(ii), the outstanding shares of Series Preferred shall be converted automatically without any further action by the holders of such shares and whether or not the certificates representing such shares are surrendered to the Company or its transfer agent; and provided, further, that the Company shall not be obligated to issue certificates evidencing the shares of Common Stock issuable upon such automatic conversion unless the certificates evidencing such shares of Series Preferred are either delivered to the Company or its transfer agent as provided above, or the holder notifies the Company or its transfer agent that such certificates have been lost, stolen, or destroyed and executes an agreement satisfactory to the Company to indemnify the Company from any loss incurred by it in connection with such certificates. The Company shall, as soon as practicable after such delivery, or, in the case of a lost certificate, after delivery of such agreement and indemnification, issue and deliver at such office to such holder of Series Preferred or to the nominee or nominees of such holder, a certificate or certificates for the number of shares of Common Stock to which such holder shall be entitled. Such conversion shall be deemed to have been made immediately prior to the close of business on the date of such surrender of the shares of Series Preferred to be converted, and the person or persons entitled to receive the shares of Common Stock issuable upon such conversion shall be treated for all purposes as the record holder or holders of such shares of Common Stock as of such date. If the conversion is in connection with an underwritten offer of securities registered pursuant to the Securities Act of 1933, as amended, the conversion may, at the option of any holder tendering Series Preferred for conversion, be conditioned upon the closing with the underwriter of the sale of securities pursuant to such offering, in which event the person(s) entitled to receive the Common Stock issuable upon such conversion of the Series Preferred shall not be deemed to have converted such stock until immediately prior to the closing of such sale of securities. In the event some but not all of the shares of Series Preferred represented by a certificate or certificates surrendered by a holder are converted, the Company shall execute and deliver to or on the order of the holder, at the expense of the Company, a new certificate representing the shares of Series Preferred that were not converted.

(iv) **Adjustments to Conversion Ratio of Senior Preferred**. The number of shares of Common Stock into which each share of Senior Preferred is convertible pursuant to Sections 4.4(d)(i) and (ii) shall be determined by dividing the applicable Original Issue Price for such share by the applicable Conversion Price (as defined below) for such share in effect at the time of conversion. The "**Series D Conversion Price**" shall initially be equal to $5.5529. The "**Series E Conversion Price**" shall initially be equal to $6.0389. The "**Series F Conversion Price**" shall initially be

equal to $8.9653. The "**Series F-1 Conversion Price**" shall initially be equal to $10.6686. Such initial Conversion Prices, and the Conversion Ratios at which shares of such series may be converted into shares of Common Stock, shall be subject to adjustment as provided below. No adjustment in the Conversion Prices of the Series D Preferred or the Series E Preferred shall be made as the result of the issuance or deemed issuance (pursuant to Section 4.4(d)(iv)(B) below) of Additional Shares of Common Stock (as defined below) if the Company receives written notice from the holders of shares amounting to a majority of the shares of the Series D Preferred and Series E Preferred issued and outstanding, voting together as a single voting group on an as-converted basis, agreeing that no such adjustment shall be made as the result of the issuance or deemed issuance of such Additional Shares of Common Stock. No adjustment in the Conversion Prices of the Series F-1 Preferred shall be made as the result of the issuance or deemed issuance (pursuant to Section 4.4(d)(iv)(B) below) of Additional Shares of Common Stock (as defined below) if the Company receives written notice from the holders of shares of Series F-1 Preferred amounting to a majority of the shares of Series F-1 Preferred issued and outstanding on an as-converted basis, agreeing that no such adjustment shall be made as the result of the issuance or deemed issuance of such Additional Shares of Common Stock. No adjustment in the Conversion Prices of the Series F Preferred shall be made as the result of the issuance or deemed issuance (pursuant to Section 4.4(d)(iv)(B) below) of Additional Shares of Common Stock (as defined below) if the Company receives written notice from the holders of shares of Series F Preferred amounting to a majority of the shares of Series F Preferred issued and outstanding on an as-converted basis, agreeing that no such adjustment shall be made as the result of the issuance or deemed issuance of such Additional Shares of Common Stock.

(A) **Special Definitions.** For purposes of this Section 4.4(d)(iv), the following definitions shall apply:

(1) "**Option**" shall mean rights, options or warrants to subscribe for, purchase or otherwise acquire Common Stock or Convertible Securities.

(2) "**Series F-1 Original Issue Date**" shall mean the date on which the first share of Series F-1 Preferred was issued.

(3) "**Convertible Securities**" shall mean any evidences of indebtedness, shares or other securities directly or indirectly convertible into or exchangeable for Common Stock, but excluding Options.

(4) "**Additional Shares of Common Stock**" shall mean all shares of Common Stock issued (or, pursuant to Subsection 4.4(d)(iv)(B) below, deemed to be issued) by the Company after the Series F-1 Original Issue Date, other than the following shares of Common Stock and shares of Common Stock deemed

issued pursuant to the following Options and Convertible Securities (collectively, "**Exempted Securities**"):

(a) Shares of Common Stock issued or issuable upon conversion of shares of Series Preferred outstanding on the Series F-1 Original Issue Date (including shares issued or issuable pursuant to the anti-dilution provisions thereof);

(b) shares of Common Stock, Options or Convertible Securities issued or issuable as a dividend or distribution on the Senior Preferred, as applicable;

(c) shares of Common Stock, Options or Convertible Securities issued or issuable by reason of a dividend, stock split, split-up or other distribution on shares of Common Stock that is covered by Sections 4.4(e), (f) or (g);

(d) shares of Common Stock or Options issued or issuable to employees or directors of, or contractors, consultants or advisors to, the Company or any of its subsidiaries pursuant to incentive agreements, stock purchase or stock option plans, stock bonuses or awards, or any other incentive plan, or similar arrangement approved by the Board of Directors;

(e) shares of Common Stock or Convertible Securities actually issued upon the exercise or conversion of Options or Convertible Securities outstanding as of the Series F-1 Original Issue Date, in each case provided such issuance is made pursuant to the terms of such Option or Convertible Security (including any anti-dilution provisions thereof);

(f) shares of Common Stock, Options or Convertible Securities issued or issuable to banks, equipment lessors or other financial institutions, or to real property lessors, pursuant to a debt financing, equipment leasing or real property leasing transaction approved by the Board of Directors;

(g) shares of Common Stock, Options or Convertible Securities issued or issuable to suppliers, third party service providers, customers, technology licensors or collaborators, or other strategic partners, in each instance, which are unaffiliated with the Company or any shareholder, officer or director of the Company and that are investing in connection with the provision of goods or services or other commercial or strategic relationships approved by the Board of Directors;

(h) shares of Common Stock, Options or Convertible Securities issued or issuable pursuant to the acquisition by the Company of another business or entity that is unaffiliated with the Company or any shareholder, officer or director of the Company, whether by merger, purchase of all or substantially all of the assets of such business or entity, or any other reorganization or joint venture arrangement in which the Company acquires, in a single transaction or series of related transactions, all or substantially all of the assets of such business or entity or fifty percent (50%) or more of the equity ownership or interest therein, provided that such issuances are approved by the Board of Directors; or

(i) shares of Common Stock issued or issuable in connection with a QPO.

(B) **Deemed Issuance of Additional Shares of Common Stock.**

(1) If the Company at any time or from time to time after the Series F-1 Original Issue Date shall issue any Options or Convertible Securities (excluding Options or Convertible Securities which are themselves Exempted Securities) or shall fix a record date for the determination of holders of any class of securities entitled to receive any such Options or Convertible Securities, then the maximum number of shares of Common Stock (as set forth in the instrument relating thereto, assuming the satisfaction of any conditions to exercisability, convertibility or exchangeability but without regard to any provision contained therein for a subsequent adjustment of such number) issuable upon the exercise of such Options or, in the case of Convertible Securities and Options therefor, the conversion or exchange of such Convertible Securities, shall be deemed to be Additional Shares of Common Stock issued as of the time of such issue or, in case such a record date shall have been fixed, as of the close of business on such record date.

(2) If the terms of any Option or Convertible Security, the issuance of which resulted in an adjustment to the Conversion Price of any series of Senior Preferred pursuant to the terms of Section 4.4(d)(iv)(C), are revised as a result of an amendment to such terms or any other adjustment pursuant to the provisions of such Option or Convertible Security (but excluding automatic adjustments to such terms pursuant to anti-dilution or similar provisions of such Option or Convertible Security) to provide for either (x) any increase or decrease in the number of shares of Common Stock issuable upon the exercise, conversion and/or exchange of any such Option or Convertible Security or (y) any increase or decrease in the consideration payable to the Company upon such exercise, conversion and/or exchange, then, effective upon such increase or decrease becoming effective, the Conversion Price of the applicable series computed upon the original issue of such Option or Convertible Security (or upon the occurrence of a record date with respect thereto) shall be readjusted to the Conversion Price of such series as would have been obtained had such revised terms been in effect upon the original date of issuance of such Option or Convertible Security. Notwithstanding the foregoing, no readjustment pursuant to this Section 4.4(d)(iv)(B)(2) shall have the effect of increasing the Conversion Price of any such series to an amount which exceeds the lower of (i) the applicable Conversion Price of such series in effect immediately prior to the original adjustment made as a result of the issuance of such Option or Convertible Security, or (ii) the applicable Conversion Price of such series that would have resulted from any issuances of Additional Shares of Common Stock (other than deemed issuances of Additional Shares of Common Stock as a result of the issuance of such Option or Convertible Security) between the original adjustment date and such readjustment date.

(3) If the terms of any Option or Convertible Security (excluding Options or Convertible Securities which are themselves Exempted Securities), the issuance of which did not result in an adjustment to the Conversion Price of any series of Senior Preferred pursuant to the terms of Section 4.4(d)(iv)(C) (either because the consideration per share, determined pursuant to Section 4.4(d)(iv)(D), of the Additional Shares of Common Stock subject thereto was equal to or greater than the Conversion Price of the applicable series of Senior Preferred then in effect, or because such Option or Convertible Security was issued before the Series F-1 Original Issue Date), are revised after the Series F-1 Original Issue Date as a result of an amendment to such terms or any other adjustment pursuant to the provisions of such Option or Convertible Security (but excluding automatic adjustments to such terms pursuant to anti-dilution or similar provisions of such Option or Convertible Security) to provide for either (x) any increase in the number of shares of Common Stock issuable upon the exercise, conversion or exchange of any such Option or Convertible Security or (y) any decrease in the consideration payable to the Company upon such exercise, conversion or exchange, then such Option or Convertible Security, as so amended or adjusted, and the Additional Shares of Common Stock subject thereto (determined in the manner provided in Section 4.4(d)(iv)(D)(2)) shall be deemed to have been issued effective upon such increase or decrease becoming effective.

(4) Upon the expiration or termination of any unexercised Option or unconverted or unexchanged Convertible Security (or portion thereof) which resulted (either upon its original issuance or upon a revision of its terms) in an adjustment to the Conversion Price of any series of Senior Preferred pursuant to the terms of Section 4.4(d)(iv)(C), the Conversion Price of the applicable series shall be readjusted to the Conversion Price of such series as would have obtained had such Option or Convertible Security (or portion thereof) never been issued.

(5) If the number of shares of Common Stock issuable upon the exercise, conversion and/or exchange of any Option or Convertible Security, or the consideration payable to the Company upon such exercise, conversion and/or exchange, is calculable at the time such Option or Convertible Security is issued or amended but is subject to adjustment based upon subsequent events, any adjustment to the Conversion Price of any series of the Senior Preferred provided for in this Section 4.4(d)(iv)(B) shall be effected at the time of such issuance or amendment based on such number of shares or amount of consideration without regard to any provisions for subsequent adjustments (and any subsequent adjustments shall be treated as provided in Sections 4.4(d)(iv)(B)(2) and (3)). If the number of shares of Common Stock issuable upon the exercise, conversion and/or exchange of any Option or Convertible Security, or the consideration payable to the Company upon such exercise, conversion and/or exchange, cannot be calculated at all at the time such Option or Convertible Security is issued or amended, any adjustment to the Conversion Price of any series of the Senior Preferred that would result under the terms of this Section 4.4(d)(iv)(B) at the time of such issuance or amendment shall instead be effected at the time such number of shares and/or amount of consideration is first calculable (even if subject to subsequent adjustments), assuming for purposes of calculating such adjustment to the Conversion Price of such series of Senior Preferred, that such issuance or amendment took place at the time such calculation can first be made.

(C) **Adjustment of Conversion Price of the Senior Preferred Upon Issuance of Additional Shares of Common Stock**. In the event the Company shall at any time after the Series F-1 Original Issue Date issue Additional Shares of Common Stock (including Additional Shares of Common Stock deemed to be issued pursuant to Section 4.4(d)(iv)(B), without consideration or for a consideration per share less than the Conversion Price of any series of Senior Preferred in effect immediately prior to such issue, then the Conversion Price of such series of Senior Preferred shall be reduced, concurrently with such issue, to a price (calculated to the nearest one-hundredth of a cent) determined in accordance with the following formula:

$$CP_2 = CP_1 * (A + B) \div (A + C).$$

For purposes of this Section 4.4(d)(iv)(C) and the foregoing formula, the following definitions shall apply:

(1) "**CP_2**" shall mean the Conversion Price of such series of Senior Preferred in effect immediately after such issue of Additional Shares of Common Stock

(2) "**CP_1**" shall mean the Conversion Price of such series of Senior Preferred in effect immediately prior to such issue of Additional Shares of Common Stock;

(3) "**A**" shall mean the number of shares of Common Stock outstanding immediately prior to such issue of Additional Shares of Common Stock (treating for this purpose as outstanding all shares of Common Stock issuable upon exercise of Options outstanding immediately prior to such issue or upon conversion or exchange of Convertible Securities (including but not limited to all Series Preferred) outstanding (assuming exercise of any outstanding Options therefor) immediately prior to such issue);

(4) "**B**" shall mean the number of shares of Common Stock that would have been issued if such Additional Shares of Common Stock had been issued at a price per share equal to CP_1 (determined by dividing the aggregate consideration received by the Company in respect of such issue by CP_1); and

(5) "**C**" shall mean the number of such Additional Shares of Common Stock issued in such transaction.

In the event the Company shall issue on more than one date Additional Shares of Common Stock that are a part of one transaction or a series of related transactions and that would result in an adjustment to the Conversion Price of any series of Senior Preferred pursuant to the terms of this Section 4.4(d)(iv)(C), then, upon the final such issuance, the Conversion Price of such series of Senior Preferred shall be readjusted to give effect to all such issuances as if they occurred on the date of the first such issuance (and without giving effect to any additional adjustments as a result of any such subsequent issuances within such period).

(D) **Determination of Consideration**. For purposes of this Section 4.4(d)(iv), the consideration received by the Company for the issue of any Additional Shares of Common Stock shall be computed as follows:

(1) **Cash and Property**. Such consideration shall:

(a) insofar as it consists of cash, be computed at the aggregate amount of cash received by the Company, after deducting therefrom any discounts, commissions or placement fees, excluding amounts paid or payable for accrued interest;

(b) insofar as it consists of property other than cash, be computed at the fair market value thereof at the time of such issue, as determined in good faith by the Board of Directors (in a manner consistent with 4.4(b)(iii) to the extent the consideration comprises securities); and

(c) in the event Additional Shares of Common Stock are issued together with other shares or securities or other assets of the Company for consideration which covers both, be the proportion of such consideration so received, computed as provided in clauses (a) and (b) above.

(2) **Options and Convertible Securities**. The consideration per share received by the Company for Additional Shares of Common Stock deemed to have been issued pursuant to Section 4.4(d)(iv)(B), relating to Options and Convertible Securities, shall be determined by dividing:

(a) The total amount, if any, received or receivable by the Company as consideration for the issue of such Options or Convertible Securities, plus the minimum aggregate amount of additional consideration (as set forth in the instruments relating thereto, without regard to any provision contained therein for a subsequent adjustment of such consideration) payable to the Company upon the exercise of such Options or the conversion or exchange of such Convertible Securities, or in the case of Options for Convertible Securities, the exercise of such Options for Convertible Securities and the conversion or exchange of such Convertible Securities, by

(b) the total maximum number of shares of Common Stock (as set forth in the instruments relating thereto, without regard to any provision contained therein for a subsequent adjustment of such number) issuable upon the exercise of such Options or the conversion or exchange of such Convertible Securities, or in the case of Options for Convertible Securities, the exercise of such Options for Convertible Securities and the conversion or exchange of such Convertible Securities.

(e) **Adjustment for Stock Splits and Combinations.** If the Company shall at any time or from time to time after the Series F-1 Original Issue Date effect a subdivision of the outstanding Common Stock, the Conversion Ratio in effect immediately before that subdivision shall be proportionately decreased so that the number of shares of Common Stock issuable on conversion of each share of Series Preferred shall be increased in proportion to such increase in the aggregate number of shares of Common Stock outstanding. If the Company shall at any time or from time to time after the Series F-1 Original Issue Date combine the outstanding shares of Common Stock, the Conversion Ratio in effect immediately before the combination shall be proportionately increased so that the number of shares of Common Stock issuable on conversion of each share of such Series Preferred shall be decreased in proportion to such decrease in the aggregate number of shares of Common Stock outstanding. Any adjustment under this Section 4.4(e) shall become effective at the close of business on the date the subdivision or combination becomes effective.

(f) **Other Distributions.** In the event the Company shall declare a distribution payable in securities of other persons, evidences of indebtedness issued by the Company or other persons, assets (excluding cash dividends) or options or rights not referred to in Section 4.4(d)(iv), then, in each such case for the purpose of this Section 4.4(f), the holders of the Series Preferred shall be entitled to a proportionate share of any such distribution as though they were the holders of the number of shares of Common Stock of the Company into which their shares of Series Preferred are convertible as of the record date fixed for the determination of the holders of Common Stock of the Company entitled to receive such distribution.

(g) **Recapitalizations.** If the Common Stock issuable upon the conversion of Series Preferred shall be changed into the same or a different number of shares of any class or classes of stock of the Company, whether by capital reorganization, reclassification or otherwise (other than a subdivision or combination of shares or stock dividend provided for in Section 4.4(e) or a merger, consolidation, share exchange or reorganization provided for in Section 4.4(b)(ii)), then and in each such event each share of Series Preferred shall be convertible into the kind and amount of shares of stock and other securities and property receivable upon such reorganization, reclassification or other change by the number of shares of Common Stock into which such share of Series Preferred might have been converted immediately prior to such reorganization, reclassification or change.

(h) **Certificate as to Adjustments**. Upon the occurrence of each adjustment or readjustment of the Conversion Ratio of any shares of Series Preferred pursuant to this Section 4.4, the Company at its expense shall, as promptly as reasonably practicable, compute such adjustment or readjustment in accordance with the terms hereof and furnish to each holder of Series Preferred whose shares are so affected a certificate setting forth such adjustment or readjustment (including the kind and amount of securities, cash or other property into which such shares of Series Preferred are then convertible) and showing in detail the facts upon which such adjustment or readjustment is based. The Company shall, as promptly as reasonably practicable after the written request at any time of any holder of shares of Series Preferred, furnish or cause to be

furnished to such holder a certificate setting forth (i) the Conversion Ratio then in effect, and (ii) the number of shares of Common Stock and the amount, if any, of other securities, cash or property which then would be received upon the conversion of such shares of Series Preferred.

(i) **No Fractional Shares.** No fractional shares of Common Stock or scrip representing fractional shares shall be issued upon the conversion of shares of Series Preferred, but the Company shall pay to the holder of such shares a cash adjustment in respect of such fractional shares in an amount equal to the same fraction of the market price per share of the Common Stock (as determined in a reasonable manner prescribed by the Board of Directors) at the close of business on the applicable conversion date. The determination as to whether or not any fractional shares are issuable shall be based upon the total number of shares of Series Preferred being converted at any one time by any holder, not upon each share of Series Preferred being converted.

(j) **Notices of Record Date.** In the event of any taking by the Company of a record of the holders of any class of securities for the purpose of determining the holders thereof who are entitled to receive any dividend (other than a cash dividend) or other distribution, any right to subscribe for, purchase or otherwise acquire any shares of stock of any class or other securities or property, or to receive any other right, or in connection with any Corporate Event, the Company shall mail to each holder of Series Preferred, at least ten (10) days prior to the date specified therein, a notice specifying the date on which any such record is to be taken for the purpose of such dividend, distribution, right or Corporate Event, and the amount and character of such dividend, distribution or right.

(k) **Reservation of Stock Issuable Upon Conversion**. The Company shall at all times reserve and keep available out of its authorized but unissued shares of Common Stock such number of its shares of Common Stock as shall be sufficient to effect the conversion of all outstanding shares of the Series Preferred; and if at any time the number of authorized but unissued shares of Common Stock shall not be sufficient to effect the conversion of all then outstanding shares of the Series Preferred, in addition to such other remedies as shall be available to the holder of such Series Preferred, the Company will take such corporate action as may, in the opinion of its counsel, be necessary to increase its authorized but unissued shares of Common Stock to such number of shares as shall be sufficient for such purposes**.**

(l) **Notices.** Any notice required by the provisions of this Section 4.4 to be given to the holders of shares of Series Preferred shall be deemed effectively given: (i) if delivered by hand, upon delivery; (ii) if by facsimile machine during normal business hours, upon transmission with confirmation of receipt by the receiving party's facsimile terminal and if not sent during normal business hours, then on the next business day; (iii) if sent by documented overnight delivery service, on the date following the date on which such notice or other written communication is delivered to such overnight delivery service for mailing; (iv) if mailed via first-class regular mail, forty-eight (48) hours after mailing to the address on record for such holder; or (v) if provided by electronic transmission to the electronic address designated by the receiving party in a consent to receive notices by electronic transmission, on the next business day.

(m) **Covenants.**

(i) In addition to any other rights provided by law and notwithstanding anything herein to the contrary (including Section 4.12), so long as at least four million (4,000,000) shares of Senior Preferred shall be outstanding (as adjusted for any Recapitalization Event), the Company shall not, without first obtaining the written consent, authorization or waiver of the Senior Preferred Majority, which consent, authorization or waiver may be obtained without the necessity of formal shareholder action or of notice to the holders of any shares of capital stock not expressly empowered with such right to consent, authorize or waive:

(A) any amendment or change to the Articles of Incorporation or Bylaws that would adversely affect the holders of Senior Preferred;

(B) any merger, consolidation, share exchange or reorganization of the Company with or into one or more other entities, or any other similar transaction or series of transactions, following which the shareholders of the Company immediately prior to such event will hold stock representing less than a majority of the voting power of the outstanding stock or voting interests of the surviving or successor entity, unless in any such case the transaction or series of transactions would result in the receipt by holders of Senior Preferred of consideration or proceeds having a value at least equal to the amount specified in Section 4.4(b)(i)(A)(1) or Section 4.4(b)(i)(B)(1), as applicable, per share of Senior Preferred;

(C) any sale, license or other disposition of all or substantially all the Company's assets, unless any such sale, license or other disposition would be followed by a distribution to holders of Senior Preferred having a value at least equal to the amount specified in Section 4.4(b)(i)(A)(1) or Section 4.4(b)(i)(B)(1), as applicable, per share of Senior Preferred;

(D) any liquidation or dissolution of the Company, other than in connection with a sale, license or other disposition of all or substantially all of its assets (which shall be subject to clause (D) above);

(E) any change in or expansion of the Company's principal business to include any lines of business outside of the biotechnology industry;

(F) any declaration or payment of a dividend or distribution on any Junior Stock;

(G) any purchase or redemption of any other class or series of capital stock (other than repurchases at not more than cost upon termination of service of an individual or entity pursuant to a restricted stock purchase agreement or equity incentive plan);

(H) any incurrence, amendment or refinancing of any indebtedness (including guarantees thereof) in the aggregate at any time in excess of $20,000,000;

(I) any material amendment to the Company's employee option plan(s) or entry into a new option plan which in the aggregate provides for the issuance of Common Stock or Options therefor exceeding the number of shares of Common Stock reserved for issuance under the Company's existing employee option plan(s) as of the Series F-1 Original Issue Date;

(J) any increase in the cash compensation (salary plus bonus entitlement) of Dr. Harlan Robins or Mr. Chad Robins to a level greater than three times the amounts in effect on April 3, 2014; and

(K) any related-party transaction with any officer, director or 5%-or-greater shareholder of the Company, involving the payment or receipt of more than $50,000 of value by the Company;

(ii) In addition to any other rights provided by law, so long as shares of Series D Preferred, shall be outstanding, the Company shall not, either directly or indirectly and whether by amendment, merger, consolidation or otherwise, without first obtaining the written consent, authorization or waiver of the holders of not less than a majority of the outstanding shares of Series D Preferred, alter or change the rights, preferences or privileges of the shares of Series D Preferred so as to adversely affect the holders of shares of Series D Preferred, including but not limited to any increase in the number of authorized shares of Series D Preferred.

(iii) In addition to any other rights provided by law, so long as shares of Series E Preferred, shall be outstanding, the Company shall not, either directly or indirectly and whether by amendment, merger, consolidation or otherwise, without first obtaining the written consent, authorization or waiver of the holders of not less than a majority of the outstanding shares of Series E Preferred, alter or change the rights, preferences or privileges of the shares of Series E Preferred so as to adversely affect the holders of shares of Series E Preferred, including but not limited to any increase in the number of authorized shares of Series E Preferred.

(iv) In addition to any other rights provided by law, so long as shares of Series F Preferred, shall be outstanding, the Company shall not, either directly or indirectly and whether by amendment, merger, consolidation or otherwise, without first obtaining the written consent, authorization or waiver of the holders of not less than a majority of the outstanding shares of Series F Preferred, alter or change the rights, preferences or privileges of the shares of Series F Preferred so as to adversely affect the holders of shares of Series F Preferred, including but not limited to any increase in the number of authorized shares of Series F Preferred.

(v) In addition to any other rights provided by law, so long as at least three million (3,000,000) shares of Junior Preferred (all such series being

aggregated for this purpose) shall be outstanding (as adjusted for any Recapitalization Event), the Company shall not, either directly or indirectly and whether by amendment, merger, consolidation or otherwise, without first obtaining the written consent, authorization or waiver of the holders of not less than a majority of the outstanding shares of Junior Preferred, voting together as a single voting group on an as-converted basis, which consent, authorization or waiver may be obtained without the necessity of formal shareholder action or of notice to the holders of any shares of capital stock other than the Junior Preferred:

(A) alter or change the rights, preferences or privileges of the shares of any series of Junior Preferred so as to materially and adversely affect the holders of shares of such series; provided, that if such material and adverse change affects any series of Junior Preferred in a manner different from any other series of Junior Preferred, then the consent of holders of not less than a majority of the outstanding shares of such series of Junior Preferred will be required; or

(B) increase the number of authorized shares of any series of Junior Preferred.

(vi) In addition to any other rights provided by law, the Company shall not, either directly or indirectly and whether by amendment, merger, consolidation or otherwise, without first obtaining the written consent, authorization or waiver of the holders of not less than a majority of the outstanding shares of Series E-1 Preferred (a) amend, waive or terminate any provision of Section 4.4(m)(v) or this Section 4.4(m)(vi), (b) increase or decrease the number of authorized shares of Series E-1 Preferred or (c) issue or obligate itself to issues shares of Series E-1 Preferred other than pursuant to exercise of options outstanding as of the date hereof.

(vii) In addition to any other rights provided by law, so long as shares of Series F-1 Preferred, shall be outstanding, the Company shall not, either directly or indirectly and whether by amendment, merger, consolidation or otherwise, without first obtaining the written consent, authorization or waiver of the holders of not less than a majority of the outstanding shares of Series F-1 Preferred alter or change the rights, preferences or privileges of the shares of Series F-1 Preferred so as to adversely affect the holders of shares of Series F-1 Preferred, including but not limited to any increase in the number of authorized shares of Series F-1 Preferred.

4.5 **Issuance of Certificates**. The Board of Directors shall have the authority to issue shares of the capital stock of this Company and the certificates therefor subject to such transfer restrictions and other limitations as it may deem necessary to promote compliance with applicable federal and state securities laws, and to regulate the transfer thereof in such manner as may be calculated to promote such compliance or to further reasonable purpose.

4.6 **No Cumulative Voting**. Shareholders of this Company shall not have the right to cumulate votes for the election of directors.

4.7 **No Preemptive Rights**. No shareholder of this Company shall have, solely by reason of being a shareholder, any preemptive or preferential right or subscription right to any stock of this Company or to any obligations convertible into stock of this Company, or to any warrant or option for the purchase thereof.

4.8 **Quorum for Meeting of Shareholders**. A quorum shall exist at any meeting of shareholders if a majority of the votes entitled to be cast is represented in person or by proxy. In the case of any meeting of shareholders that is adjourned more than once because of the failure of a quorum to attend, those who attend the third convening of such meeting, although less than a quorum, shall nevertheless constitute a quorum for the purpose of electing directors, provided that the percentage of shares represented at the third convening of such meeting shall not be less than one-third of the votes entitled to be cast.

4.9 **Execution of Consent by Less than Unanimous Consent of Shareholders**. To the extent permitted by, and in accordance with the procedures set forth in, the Act, the taking of action by shareholders without a meeting by less than unanimous written consent of all shareholders entitled to vote on the action shall be permitted. Shareholder action taken pursuant to this Section 4.9 shall be effective when executed consents sufficient to approve the proposed corporate action have been delivered to the Company, either at an address designated by the Company for delivery of such shareholder consents or at the Company's registered office, or to such electronic address, location, or system as the Company may have designated for delivery of such shareholder consents.

4.10 **Contracts with Interested Shareholders**. Subject to the limitations set forth in RCW 23B.19.040, to the extent applicable:

(a) The Company may enter into contracts and otherwise transact business as vendor, purchaser, lender, borrower, or otherwise with its shareholders and with corporations, associations, firms, and entities in which they are or may be or become interested as directors, officers, shareholders, members, or otherwise.

(b) Any such contract or transaction shall not be affected or invalidated or give rise to liability by reason of the shareholder's having an interest in the contract or transaction.

4.11 **Ratification by Shareholder Vote**. Subject to the requirements of RCW 23B.08.730 and 23B.19.040, to the extent applicable, any contract, transaction, or act of the Company or of any director or officer of the Company that shall be authorized, approved, or ratified by the affirmative vote of a majority of shares represented at a meeting at which a quorum is present shall, insofar as permitted by law, be as valid and as binding as though ratified by every shareholder of the Company.

4.12 **Action by Majority Vote; Reduced Voting Requirements**. The provisions of this Section 4.12 are specifically intended to reduce the voting requirements otherwise prescribed under RCW 23B.10.030, 23B.11.030, 23B.12.020 and 23B.14.020,

in accordance with RCW 23B.07.270. In the case of any matter submitted to a vote of the shareholders of this Company for which the Act requires (unless these Articles provide otherwise) the approval of two-thirds of the votes of each voting group entitled to be cast thereon, the approval of a majority, rather than two-thirds, of the votes of each voting group entitled to be cast on such matter shall be sufficient for such matter to be approved. Without limiting the generality of the foregoing, such matters are intended to include, to the extent not inconsistent with the Act, amendments to these Articles, mergers and share exchanges, sales of assets other than in the ordinary course of business, and dissolution. In addition, except as otherwise provided in these Articles, as amended from time to time, the application of separate voting group rights under RCW 23B.10.040(1)(a), (e) or (f), or 23B.11.035 (or any related section concerning voting group rights as to mergers or share exchanges), is hereby explicitly denied.

ARTICLE 5

DIRECTORS

5.1 **Number of Directors**. Except as may be provided in these Articles as amended from time to time, the number of directors of the Company shall be fixed as provided in the Bylaws and may be changed from time to time by amending the Bylaws.

5.2 **Authority of Board of Directors to Amend Bylaws**. Subject to the limitation(s) of RCW 23B.10.200, Board of Directors is expressly authorized to make, amend, or repeal the Bylaws of the Company.

5.3 **Contracts with Interested Directors**. Subject to the limitations set forth in RCW 23B.08.700 through 23B.08.730, to the extent applicable:

(a) The Company may enter into contracts and otherwise transact business as vendor, purchaser, lender, borrower, or otherwise with its directors and with corporations, associations, firms, and entities in which they are or may be or become interested as directors, officers, shareholders, members, or otherwise.

(b) Any such contract or transaction shall not be affected or invalidated or give rise to liability by reason of the director’s having an interest in the contract or transaction.

5.4 **Indemnification of Directors, Officers, Employees and Agents**. The capitalized terms in this Section 5.4 shall have the meanings set forth in RCW 23B.08.500.

(a) The Company shall indemnify and hold harmless each individual who is or was serving as a Director or officer of the Company or who, while serving as a Director or officer of the Company, is or was serving at the request of the Company as a director, officer, partner, trustee, employee, or agent of another foreign or domestic corporation, partnership, joint venture, trust, employee benefit plan, or other enterprise, against any and all Liability incurred with respect to any Proceeding to which the individual is or is threatened to be made a Party because of such service, and shall make

advances of reasonable Expenses with respect to such Proceeding, to the fullest extent permitted by law, without regard to the limitations in RCW 23B.08.510 through 23B.08.550 and RCW 23B.08.560(2); provided that no such indemnity shall indemnify any Director or officer from or on account of (i) acts or omissions of the Director or officer finally adjudged to be intentional misconduct or a knowing violation of law; (ii) conduct of the Director or officer finally adjudged to be in violation of RCW 23B.08.310; or (iii) any transaction with respect to which it was finally adjudged that such Director or officer personally received a benefit in money, property, or services to which the Director or officer was not legally entitled.

(b) The Company may purchase and maintain insurance on behalf of an individual who is or was a director, officer, employee, or agent of the Company or, who, while a director, officer, employee, or agent of the Company, is or was serving at the request of the Company as a director, officer, partner, trustee, employee, or agent of another foreign or domestic corporation, partnership, joint venture, trust, employee benefit plan, or other enterprise against Liability asserted against or incurred by the individual in that capacity or arising from the individual's status as a director, officer, employee, or agent, whether or not the Company would have power to indemnify the individual against such Liability under RCW 23B.08.510 or 23B.08.520.

(c) If, after the effective date of this Section 5.4, the Act is amended to authorize further indemnification of Directors or officers, then Directors and officers of the Company shall be indemnified to the fullest extent permitted by the Act.

(d) To the extent permitted by law, the rights to indemnification and advance of reasonable Expenses conferred in this Section 5.4 shall not be exclusive of any other right which any individual may have or hereafter acquire under any statute, provision of the Bylaws, agreement, vote of shareholders or disinterested directors, or otherwise. The right to indemnification conferred in this Section 5.4 shall be a contract right upon which each Director or officer shall be presumed to have relied in determining to serve or to continue to serve as such. Any amendment to or repeal of this Section 5.4 shall not adversely affect any right or protection of a Director or officer of the Company for or with respect to any acts or omissions of such Director or officer occurring prior to such amendment or repeal.

(e) If any provision of this Section 5.4 or any application thereof shall be invalid, unenforceable, or contrary to applicable law, the remainder of this Section 5.4, and the application of such provisions to individuals or circumstances other than those as to which it is held invalid, unenforceable, or contrary to applicable law, shall not be affected thereby.

5.5 **Limitation of Directors' Liability**. To the fullest extent permitted by the Act, as it exists on the date hereof or may hereafter be amended, a director of this Company shall not be personally liable to the Company or its shareholders for monetary damages for conduct as a director. Any amendment to or repeal of this Section 5.5 shall not adversely affect a director of this Company with respect to any conduct of such director occurring prior to such amendment or repeal.

ARTICLE 6

OTHER MATTERS

6.1 **Amendments to Articles of Incorporation**. Except as otherwise provided in these Articles, as amended from time to time, the Company reserves the right to amend, alter, change, or repeal any provisions contained in these Articles in any manner now or hereafter prescribed or permitted by statute. All rights of shareholders of the Company are subject to this reservation. A shareholder of the Company does not have a vested property right resulting from any provision of these Articles.

6.2 **Correction of Clerical Errors**. The Company shall have authority to correct clerical errors in any documents filed with the Secretary of State of Washington, including these Articles or any amendments hereto, without the necessity of special shareholder approval of such corrections.

Executed this 30th day of May, 2019.

By: /s/ Chad M. Robins
Chad M. Robins
Chief Executive Officer

Exhibit 3.3

BYLAWS

OF

ADAPTIVE BIOTECHNOLOGIES CORPORATION

Originally adopted on September 14, 2009
Amendments are listed on p. i

ADAPTIVE BIOTECHNOLOGIES CORPORATION

AMENDMENTS TO BYLAWS

Article	Effect of Amendment	Date of Amendment
II, Sec. 2.2	Board ratifies, confirms and approves that incorporator set the number of directors comprising the Board initially at one (1) member.	09/14/09
	Board ratifies, confirms and approves an amendment to reflect the name change from Adaptive TCR Corporation to Adaptive Biotechnologies Corporation, in connection with the filing of the Articles of Amendment to the Amended and Restated Articles of Incorporation on December 21, 2011.	12/20/11
II, Sec. 2.2	Board ratifies, confirms and approves an amendment to increase the maximum number of directors comprising the Board from seven (7) to nine (9).	04/03/14
II, Sec. 2.2	Board ratifies, confirms and approves an amendment to increase the maximum number of directors comprising the Board from nine (9) to eleven (11).	12/19/14
I, Sec. 1.2; II, Sec. 2.6 & 2.9; III, Sec. 3.9	Board ratifies, confirms and approves an amendment to replace all references therein to “the President” with reference to “the President or the Chief Executive Officer”.	02/07/18

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BYLAWS OF

ADAPTIVE BIOTECHNOLOGIES CORPORATION

These Bylaws are promulgated pursuant to the Washington Business Corporation Act, as set forth in Title 23B of the Revised Code of Washington (the "**Act**").

ARTICLE I

SHAREHOLDERS

1.1 Annual Meeting.

1.1.1 Time and Place of Meeting. The annual meeting of the shareholders of the corporation for the election of Directors and for the transaction of such other business as may properly come before the meeting shall be held each year at a place, day, and time to be set by the Board of Directors.

1.1.2 Business Conducted at Meeting.

(a) At the annual meeting of shareholders, an item of business may be conducted, and a proposal may be considered and acted upon, only if such item or proposal is brought before the meeting (i) by, or at the direction of, the Board of Directors, or (ii) by any shareholder of the corporation who is entitled to vote at the meeting and who complies with the procedures set forth in the remainder of this Section 1.1.2. This Section 1.1.2 shall not apply to matters of procedure that, pursuant to Section 10.3(a) of these Bylaws, are subject to the authority of the chairman of the meeting.

(b) For an item of business or proposal to be brought before an annual meeting by a shareholder, the shareholder must have given timely notice thereof in writing to the Secretary of the corporation. To be timely, a shareholder's notice must be delivered to, or mailed and received at, the principal office of the corporation (i) not less than one hundred twenty (120) days prior to the first anniversary of the date that the corporation's proxy statement was first released to shareholders in connection with the previous year's annual meeting; (ii) a reasonable time before the corporation begins to print and mail its proxy materials if the date of the current year's annual meeting has been changed by more than thirty (30) days from the date of the previous year's meeting; or (iii) not more than seven (7) days following the mailing to shareholders of the notice of annual meeting with respect to the current year's annual meeting, if the corporation did not release a proxy statement to shareholders in connection with the previous year's annual meeting, or if no annual meeting was held during such year.

(c) A shareholder's notice to the Secretary under Section 1.1.2(b) shall set forth, as to each item of business or proposal the shareholder intends to bring before the meeting (i) a brief description of the item of business or proposal and the reasons for bringing it before the meeting, (ii) the name and address, as they appear on the corporation's books, of the

shareholder and of any other shareholders that the shareholder knows or anticipates will support the item of business or proposal, (iii) the number and class of shares of stock of the corporation that are beneficially owned on the date of such notice by the shareholder and by any such other shareholders, and (iv) any financial interest of the shareholder or any such other shareholders in such item of business or proposal.

(d) The Board of Directors, or a designated committee thereof, may reject a shareholder's notice that is not timely given in accordance with the terms of Section 1.1.2(b). If the Board of Directors, or a designated committee thereof, determines that the information provided in a timely shareholder's notice does not satisfy the requirements of Section 1.1.2(c) in any material respect, the Secretary of the corporation shall notify the shareholder of the deficiency in the notice. The shareholder shall have an opportunity to cure the deficiency by providing additional information to the Secretary within such period of time, not to exceed five (5) days from the date such deficiency notice is given to the shareholder, as the Board of Directors or such committee shall reasonably determine. If the deficiency is not cured within such period, or if the Board of Directors or such committee determines that the additional information provided by the shareholder, together with information previously provided, does not satisfy the requirements of Section 1.1.2(c) in any material respect, then the Board of Directors or such committee may reject the shareholder's notice.

(e) Notwithstanding the procedures set forth in Section 1.1.2(d), if a shareholder desires to bring an item of business or proposal before an annual meeting, and neither the Board of Directors nor any committee thereof has made a prior determination of whether the shareholder has complied with the procedures set forth in this Section 1.1.2 in connection with such item of business or proposal, then the chairman of the meeting shall determine and declare at the meeting whether the shareholder has so complied. If the chairman determines that the shareholder has so complied, then the chairman shall so state and ballots shall be provided for use at the meeting with respect to such item of business or proposal. If the chairman determines that the shareholder has not so complied, then, unless the chairman, in his sole and absolute discretion, determines to waive such compliance, the chairman shall state that the shareholder has not so complied and the item of business or proposal shall not be brought before the meeting.

This Section 1.1.2 shall not prevent the consideration and approval or disapproval at the annual meeting of reports of officers, directors and committees of the Board of Directors, but, in connection with such reports, no item of business may be conducted, and no proposal may be considered and acted upon, unless there has been compliance with the procedures set forth in this Section 1.1.2 in connection therewith.

1.2 Special Meetings. Special meetings of the shareholders for any purpose or purposes may be called at any time by the Board of Directors or by the Chairman of the Board (if one be appointed) or by the President or the Chief Executive Officer or by one or more shareholders holding shares entitled to cast not less than one-tenth (1/10) of all the votes entitled to be cast on any issue proposed to be considered at that meeting, to be held at such time and place as the Board of Directors or the Chairman (if one be appointed) or the President or the Chief Executive Officer may prescribe; provided, that, at any time when the corporation is

subject to the reporting requirements of Section 13 of the Securities Exchange Act of 1934, as amended (the "**Exchange Act**"), special meetings of the shareholders for any purpose or purposes may be called at any time only by the Board of Directors or the Chairman of the Board of Directors (if one be appointed) or the President or the Chief Executive Officer or one or more shareholders holding not less than twenty-five percent (25%) of all the shares entitled to be cast on any issue proposed to be considered at that meeting.

If a special meeting is called by any person or persons other than the Board of Directors or the Chairman of the Board (if one be appointed) or the President or the Chief Executive Officer, then a written demand, describing with reasonable clarity the purpose or purposes for which the meeting is called and specifying the general nature of the business proposed to be transacted, shall be delivered personally or sent by registered mail or by telegraphic or other facsimile transmission to the Secretary of the corporation. Upon receipt of such a demand, the Secretary shall cause notice of such meeting to be given, within thirty (30) days after the date the demand was delivered to the Secretary, to the shareholders entitled to vote, in accordance with the provisions of Section 1.3 of these Bylaws. Except as provided below, if the notice is not given by the Secretary within thirty (30) days after the date the demand was delivered to the Secretary, then the person or persons demanding the meeting may specify the time and place of the meeting and give notice thereof.

1.3 Notice of Meetings. Except as otherwise provided below, the Secretary, Assistant Secretary, or any transfer agent of the corporation shall give, in any manner permitted by law, not less than ten (10) nor more than sixty (60) days before the date of any meeting of shareholders, written notice stating the place, day, and time of the meeting to each shareholder of record entitled to vote at such meeting. Written notice may be transmitted by mail, private carrier or personal delivery; telegraph, wire or wireless equipment that transmits a facsimile of the notice. If mailed, notice to a shareholder shall be effective when mailed, with first-class postage thereon prepaid, correctly addressed to the shareholder at the shareholder's address as it appears on the current record of shareholders of the corporation. Otherwise, written notice may be given by any of the following means and shall be effective at the earliest of the following: (a) If sent to the person's address, or facsimile number when dispatched by telegraph or facsimile equipment, (b) when received, (c) on the date shown on the return receipt, if sent by registered or certified mail, return receipt requested, and the receipt is signed by or on behalf of the addressee, or (d) on the next business day if transmitted electronically to an electronic address designated by the shareholder in a consent to receive notices electronically.

1.3.1 Notice of Special Meeting. In the case of a special meeting, the written notice shall also state with reasonable clarity the purpose or purposes for which the meeting is called and the general nature of the business proposed to be transacted at the meeting. No business other than that within the purpose or purposes specified in the notice may be transacted at a special meeting.

1.3.2 Proposed Articles of Amendment, Merger, Exchange, Sale, Lease or Disposition. If the business to be conducted at any meeting includes any proposed amendment to the Articles of Incorporation or any proposed merger or exchange of shares, or any proposed sale, lease, exchange, or other disposition of all or substantially all of the property and assets

(with or without the goodwill) of the corporation not in the usual or regular course of its business, then the written notice shall state that the purpose or one of the purposes is to consider the proposed amendment or plan of merger, exchange of shares, sale, lease, exchange, or other disposition, as the case may be, shall describe the proposed action with reasonable clarity, and shall be accompanied by a copy of the proposed amendment or plan. Written notice of such meeting shall be given to each shareholder of record, whether or not entitled to vote at such meeting, not less than twenty (20) days before such meeting, in the manner provided in Section 1.3 above.

1.3.3 Proposed Dissolution. If the business to be conducted at any meeting includes the proposed voluntary dissolution of the corporation, then the written notice shall state that the purpose or one of the purposes is to consider the advisability thereof. Written notice of such meeting shall be given to each shareholder of record, whether or not entitled to vote at such meeting, not less than twenty (20) days before such meeting, in the manner provided in Section 1.3 above.

1.3.4 Declaration of Mailing. A declaration of the mailing or other means of giving any notice of any shareholders' meeting, executed by the Secretary, Assistant Secretary, or any transfer or other agent of the corporation giving the notice, shall be prima facie evidence of the giving of such notice.

1.3.5 Waiver of Notice. A shareholder may waive notice of any meeting at any time, either before or after such meeting. Except as provided below, the waiver must be in writing, be signed by the shareholder entitled to the notice, and be delivered to the corporation for inclusion in the minutes or filing with the corporate records. A shareholder's attendance at a meeting in person or by proxy waives objection to lack of notice or defective notice of the meeting unless the shareholder at the beginning of the meeting objects to holding the meeting or transacting business at the meeting on the ground that the meeting is not lawfully called or convened. In the case of a special meeting, or an annual meeting at which fundamental corporate changes are considered, a shareholder waives objection to consideration of a particular matter that is not within the purpose or purposes described in the meeting notice unless the shareholder objects to considering the matter when it is presented.

1.4 Quorum; Vote Requirement. A quorum shall exist at any meeting of shareholders if a majority of the votes entitled to be cast is represented in person or by proxy. Once a share is represented for any purpose at a meeting other than solely to object to holding the meeting or transacting business at the meeting, it is deemed present for quorum purposes for the remainder of the meeting and for any adjournment of that meeting unless a new record date is or must be set for that adjourned meeting. Subject to the foregoing, the determination of the voting groups entitled to vote (as required by law), and the quorum and voting requirements applicable thereto, must be made separately for each matter being considered at a meeting. In the case of any meeting of shareholders that is adjourned more than once because of the failure of a quorum to attend, those who attend the third convening of such meeting, although less than a quorum, shall nevertheless constitute a quorum for the purpose of electing directors, provided that the percentage of shares represented at the third convening of such meeting shall not be less than one-third of the shares entitled to vote.

If a quorum exists, action on a matter (other than the election of directors) is approved by a voting group if the votes cast within the voting group favoring the action exceed the votes cast within the voting group opposing the action unless a greater number of affirmative votes is required by law or by the Articles of Incorporation.

1.5 Adjourned Meetings. An adjournment or adjournments of any shareholders' meeting, whether by reason of the failure of a quorum to attend or otherwise, may be taken to such date, time, and place as the chairman of the meeting may determine without new notice being given if the date, time, and place are announced at the meeting at which the adjournment is taken. However, if the adjournment is for more than one hundred twenty (120) days from the date set for the original meeting, a new record date for the adjourned meeting shall be fixed and a new notice of the adjourned meeting shall be given to each shareholder of record entitled to vote at the adjourned meeting, in accordance with the provisions of Section 1.3 of these Bylaws. At any adjourned meeting, the corporation may transact any business which might have been transacted at the original meeting. Any meeting at which directors are to be elected shall be adjourned only from day to day until such directors are elected.

1.6 Fixing Record Date. For the purpose of determining shareholders entitled to notice of or to vote at any meeting of shareholders (or, subject to Section 1.5 above, any adjournment thereof), the Board of Directors may fix in advance a date as the record date for any such determination of shareholders, such date in any case to be not more than seventy (70) days prior to the meeting. If no such record date is fixed for the determination of shareholders entitled to notice of or to vote at a meeting of shareholders, then the day before the first notice is delivered to shareholders shall be the record date for such determination of shareholders. If no notice is given because all shareholders entitled to notice have waived notice, then the record date for the determination of shareholders entitled to notice of or to vote at a meeting shall be the date on which the last such waiver of notice was obtained. When a determination of shareholders entitled to vote at any meeting of shareholders has been made as provided in this section, such determination shall apply to any adjournment thereof, except as provided in Section 1.5 of these Bylaws. If no notice is given because shareholders holding of record or otherwise entitled to vote in the aggregate not less than the minimum number of votes necessary in order to take such action by written consent have signed a consent, the record date for determining shareholders entitled to take action without a meeting is the date the first shareholder signs the consent.

1.7 Shareholders' List for Meeting. The corporation shall cause to be prepared an alphabetical list of the names of all of its shareholders on the record date who are entitled to notice of a shareholders' meeting or any adjournment thereof. The list must be arranged by voting group (and within each voting group by class or series of shares) and show the address of and the number of shares held by each shareholder. The shareholders' list must be available for inspection by any shareholder, beginning ten (10) days prior to the meeting and continuing through the meeting, at the principal office of the corporation or at a place identified in the meeting notice in the city where the meeting will be held. Such list shall be produced and kept open at the time and place of the meeting. During such ten-day period, and during the whole time of the meeting, the shareholders' list shall be subject to the inspection of any shareholder, or the shareholder's agent or attorney. In cases where the record date is fewer than ten (10) days

prior to the meeting because notice has been waived by all shareholders, the Secretary shall keep such record available for a period from the date the first waiver of notice was delivered to the date of the meeting. Failure to comply with the requirements of this section shall not affect the validity of any action taken at the meeting.

1.8 Ratification. Subject to the requirements of RCW 23B.08.730 and 23B.19.040 (to the extent applicable), any contract, transaction, or act of the corporation or of any director or officer of the corporation that shall be authorized, approved, or ratified by the affirmative vote of a majority of shares represented at a meeting at which a quorum is present shall, insofar as permitted by law, be as valid and as binding as though ratified by every shareholder of the corporation.

1.9 Telephonic Meetings. Shareholders may participate in a meeting by any means of communication by which all persons participating in the meeting can hear each other during the meeting, and participation by such means shall constitute presence in person at a meeting.

1.10 Execution of Consent by Less than Unanimous Consent of Shareholders. To the extent permitted by, and in accordance with the procedures set forth in, the Act, the taking of action by shareholders without a meeting by less than unanimous written consent of all shareholders entitled to vote on the action shall be permitted.

ARTICLE II

BOARD OF DIRECTORS

2.1 Responsibility of Board of Directors. The business and affairs and property of the corporation shall be managed under the direction of a Board of Directors. A director shall discharge the duties of a director, including duties as a member of a committee, in good faith, with the care an ordinarily prudent person in a like position would exercise under similar circumstances, and in a manner the director reasonably believes to be in the best interests of the corporation. In discharging the duties of a director, a director is entitled to rely on information, opinions, reports, or statements, including financial statements and other financial data, if prepared or presented by: (a) one or more officers or employees of the corporation whom the director reasonably believes to be reliable and competent in the matters presented; (b) legal counsel, public accountants, or other persons as to matters the director reasonably believes are within the person's professional or expert competence; or (c) a committee of the Board of Directors of which the director is not a member, if the director reasonably believes the committee merits confidence. A director is not acting in good faith if the director has knowledge concerning the matter in question that makes reliance otherwise permitted above unwarranted. The creation of, delegation of authority to, or action by a committee does not alone constitute compliance by a director with the standards of conduct imposed by law upon directors. A director is not liable for any action taken as a director, or any failure to take any action, if the director performed the duties of the director's office in compliance with this section.

2.2 Number of Directors; Qualification. The number of directors of the corporation shall be between one (1) and eleven (11), the specific number to be set by resolution of the Board of Directors. No reduction of the authorized number of directors shall have the effect of removing any director before that director's term of office expires. No director need be a shareholder of the corporation or a resident of Washington. Each director must be at least eighteen (18) years of age.

2.3 Election of Directors; Nominations.

2.3.1 Election and Term of Office. At each annual meeting of shareholders, the shareholders shall elect directors. Unless otherwise provided in the articles of incorporation, shareholders entitled to vote at any election of directors are entitled to cumulate votes for directors as permitted by RCW 23B.07.280. Unless otherwise provided in the articles of incorporation, in any election of directors the candidates elected are those receiving the largest numbers of votes cast by the shares entitled to vote in the election, up to the number of directors to be elected by such shares. Each director shall hold office until the next succeeding annual meeting or, in the case of staggered terms as permitted by RCW 23B.08.060, for the term for which he or she is elected, and in each case until his or her successor shall have been elected and qualified.

2.3.2 Nominations for Directors.

(a) Nominations of candidates for election as directors at an annual meeting of shareholders may only be made (i) by, or at the direction of, the Board of Directors or (ii) by any shareholder of the corporation who is entitled to vote at the meeting and who complies with the procedures set forth in the remainder of this Section 2.3.2.

(b) If a shareholder proposes to nominate one or more candidates for election as directors at an annual meeting, the shareholder must have given timely notice thereof in writing to the Secretary of the corporation. To be timely, a shareholder's notice must be delivered to, or mailed and received at, the principal office of the corporation (i) not less than one hundred twenty (120) days prior to the first anniversary of the date that the corporation's proxy statement was released to shareholders in connection with the previous year's annual meeting; (ii) a reasonable time before the corporation begins to print and mail its proxy materials if the date of this year's annual meeting has been changed by more than thirty (30) days from the date of the previous year's meeting; or (iii) not more than seven (7) days following the mailing to shareholders of the notice of annual meeting with respect to the current year's annual meeting, if the corporation did not release a proxy statement to shareholders in connection with the previous year's annual meeting, or if no annual meeting was held during such year.

(c) A shareholder's notice to the Secretary under Section 2.3.2(b) shall set forth, as to each person whom the shareholder proposes to nominate for election as a director (i) the name, age, business address and residence address of such person, (ii) the principal occupation or employment of such person, (iii) the number and class of shares of stock of the corporation that are beneficially owned on the date of such notice by such person and (iv) if the corporation at such time has a class of securities registered pursuant to Section 12 of the

Exchange Act, any other information relating to such person required to be disclosed in solicitations of proxies with respect to nominees for election as directors pursuant to Regulation 14A under the Exchange Act, including, but not limited to, information required to be disclosed by Schedule 14A of Regulation 14A, and any other information that the shareholder would be required to file with the Securities and Exchange Commission in connection with the shareholder's nomination of such person as a candidate for director or the shareholder's opposition to any candidate for director nominated by, or at the direction of, the Board of Directors. In addition to the above information, a shareholder's notice to the Secretary under Section 2.3.2(b) shall (A) set forth (i) the name and address, as they appear on the corporation's books, of the shareholder and of any other shareholders that the shareholder knows or anticipates will support any candidate or candidates nominated by the shareholder and (ii) the number and class of shares of stock of the corporation that are beneficially owned on the date of such notice by the shareholder and by any such other shareholders and (B) be accompanied by a written statement, signed and acknowledged by each candidate nominated by the shareholder, that the candidate agrees to be so nominated and to serve as a director of the corporation if elected at the annual meeting.

(d) The Board of Directors, or a designated committee thereof, may reject any shareholder's nomination of one or more candidates for election as directors if the nomination is not made pursuant to a shareholder's notice timely given in accordance with the terms of Section 2.3.2(b). If the Board of Directors, or a designated committee thereof, determines that the information provided in a shareholder's notice does not satisfy the requirements of Section 2.3.2(c) in any material respect, the Secretary of the corporation shall notify the shareholder of the deficiency in the notice. The shareholder shall have an opportunity to cure the deficiency by providing additional information to the Secretary within such period of time, not to exceed five (5) days from the date such deficiency notice is given to the shareholder, as the Board of Directors or such committee shall reasonably determine. If the deficiency is not cured within such period, or if the Board of Directors or such committee determines that the additional information provided by the shareholder, together with information previously provided, does not satisfy the requirements of Section 2.3.2(c) in any material respect, then the Board of Directors or such committee may reject the shareholder's notice.

(e) Notwithstanding the procedures set forth in Section 2.3.2(d), if a shareholder proposes to nominate one or more candidates for election as directors at an annual meeting, and neither the Board of Directors nor any committee thereof has made a prior determination of whether the shareholder has complied with the procedures set forth in this Section 2.3.2 in connection with such nomination, then the chairman of the annual meeting shall determine and declare at the annual meeting whether the shareholder has so complied. If the chairman determines that the shareholder has so complied, then the chairman shall so state and ballots shall be provided for use at the meeting with respect to such nomination. If the chairman determines that the shareholder has not so complied, then, unless the chairman, in his sole and absolute discretion, determines to waive such compliance, the chairman shall state that the shareholder has not so complied and the defective nomination shall be disregard.

2.4 Vacancies. Except as otherwise provided by law, any vacancy occurring in the Board of Directors (whether caused by resignation, death, or otherwise) may be filled by the

affirmative vote of a majority of the directors present at a meeting of the Board of Directors at which a quorum is present, or, if the directors in office constitute less than a quorum, by the affirmative vote of a majority of all of the directors in office. Notice shall be given to all of the remaining directors that such vacancy will be filled at the meeting. However, if the vacant office was held by a director elected by a voting group composed of less than all of the voting shareholders, then the Board of Directors shall not have the power to fill such vacancy. A director elected to fill any vacancy shall hold office until the next meeting of shareholders at which directors are elected, and until his or her successor shall have been elected and qualified.

2.5 Removal. One or more members of the Board of Directors (including the entire Board of Directors) may be removed, with or without cause, at a special meeting of shareholders called expressly for that purpose. A director (or the entire Board of Directors) may be removed if the number of votes cast in favor of removing such director (or the entire Board of Directors) exceeds the number of votes cast against removal; provided that, if a director (or the entire Board of Directors) has been elected by one or more voting groups, only those voting groups may participate in the vote as to removal. However, if the Articles of Incorporation grant shareholders the right to cumulate their votes in the election of directors, a director may not be removed if a number of votes sufficient to elect such director under cumulative voting (computed on the basis of the number of votes actually cast at the meeting on the question of removal) is cast against such director's removal.

2.6 Resignation. A director may resign at any time by delivering written notice to the Board of Directors, its Chairman, the President or the Chief Executive Officer, or the Secretary. A resignation is effective when the notice is delivered unless the notice specifies a later effective date.

2.7 Annual Meeting. The first meeting of each newly elected Board of Directors shall be known as the annual meeting thereof and shall be held without notice immediately after the annual shareholders' meeting or any special shareholders' meeting at which a Board of Directors is elected. Such meeting shall be held at the same place as such shareholders' meeting unless some other place shall be specified by resolution of the shareholders.

2.8 Regular Meetings. Regular meetings of the Board of Directors may be held at such place, day, and time as shall from time to time be fixed by resolution of the Board of Directors without notice other than the delivery of such resolution as provided in Section 2.10 below.

2.9 Special Meetings. Special meetings of the Board of Directors may be called by the President or the Chief Executive Officer, or the Chairman of the Board (if one be appointed) or any two or more directors, to be held at such place, day, and time as specified by the person or persons calling the meeting.

2.10 Notice of Meeting. Notice of the place, day, and time of any meeting of the Board of Directors for which notice is required shall be given, at least two (2) days preceding the day on which the meeting is to be held, by the Secretary or an Assistant Secretary, or by the person calling the meeting, in any manner permitted by law, including orally or via electronic

transmission. Any oral notice given by personal communication over the telephone or otherwise may be communicated either to the director or to a person at the office of the director who, the person giving the notice has reason to believe, will promptly communicate it to the director. Notice shall be deemed to have been given on the earliest of (a) the day of actual receipt, (b) five (5) days after the day on which written notice is deposited in the United States mail, as evidenced by the postmark, with first-class postage prepaid, and correctly addressed, (c) on the date shown on the return receipt, if sent by registered or certified mail, return receipt requested, and the receipt is signed by or on behalf of the addressee, or (d) on the next business day if transmitted electronically during normal business hours of the director.

No notice of any regular meeting need be given if the place, day, and time thereof have been fixed by resolution of the Board of Directors and a copy of such resolution has been given to each director, either by personally delivering the copy to the director at least two (2) days, or by depositing the copy in the United States mail with first class postage prepaid and correctly addressed to the director at the director's address as it appears on the records of the corporation at least five (5) days (as evidenced by the postmark), prior to the day of the first meeting held in pursuance thereof.

Notice of a meeting of the Board of Directors need not be given to any director if it is waived by the director in writing, whether before or after such meeting is held. Neither the business to be transacted at, nor the purpose of, any regular or special meeting of the Board of Directors need be specified in the notice or waiver of notice of such meeting unless required by law, the Articles of Incorporation, or these Bylaws.

A director's attendance at or participation in a meeting shall constitute a waiver of notice of such meeting except when a director attends or participates in a meeting for the express purpose of objecting on legal grounds prior to or at the beginning of the meeting (or promptly upon the director's arrival) to the holding of the meeting or the transaction of any business and does not thereafter vote for or assent to action taken at the meeting. Any meeting of the Board of Directors shall be a legal meeting without any notice thereof having been given if all of the directors have received valid notice thereof, are present without objecting, or waive notice thereof, or any combination thereof.

2.11 Quorum of Directors. Except in particular situations where a lesser number is expressly permitted by law, and unless a greater number is required by the Articles of Incorporation, a majority of the number of directors specified in or fixed in accordance with these Bylaws shall constitute a quorum for the transaction of business, and the affirmative vote of a majority of the directors present at a meeting at which a quorum is present shall be the act of the Board of Directors. If the number of directors in office at any time is less than the number specified in or fixed in accordance with these Bylaws, then a quorum shall consist of a majority of the number of directors in office; provided that in no event shall a quorum consist of fewer than one-third of the number specified in or fixed in accordance with these Bylaws.

Directors at a meeting of the Board of Directors at which a quorum is initially present may continue to transact business notwithstanding the withdrawal of directors, provided such withdrawal does not reduce the number of directors attending the meeting below the level of a quorum.

A majority of the directors present, whether or not constituting a quorum, may adjourn any meeting of the Board of Directors to another time and place. If the meeting is adjourned for more than forty-eight (48) hours, then notice of the time and place of the adjourned meeting shall be given before the adjourned meeting takes place, in the manner specified in Section 2.10 of these Bylaws, to the directors who were not present at the time of the adjournment.

2.12 Dissent by Directors. Any director who is present at any meeting of the Board of Directors at which action on any corporate matter is taken shall be presumed to have assented to the action taken unless the director objects at the beginning of the meeting (or promptly upon the director's arrival) to the holding of, or the transaction of business at, the meeting; or unless the director's dissent or abstention shall be entered in the minutes of the meeting; or unless the director delivers written notice of the director's dissent or abstention to the presiding officer of the meeting before the adjournment thereof or to the corporation within a reasonable time after the adjournment of the meeting. Such right to dissent or abstention shall not be available to any director who votes in favor of such action.

2.13 Action by Directors Without a Meeting. Any action required by law to be taken or which may be taken at a meeting of the Board of Directors may be taken without a meeting if one or more consents in writing, setting forth the action so taken, shall be signed either before or after the action so taken by all of the directors and delivered to the corporation for inclusion in the minutes or filing with the corporate records. Such consent shall have the same effect as a meeting vote. Action taken under this section is effective when the last director signs the consent, unless the consent specifies a later effective date.

2.14 Telephonic Meetings. Except as may be otherwise restricted by the Articles of Incorporation, members of the Board of Directors may participate in a meeting of the Board of Directors by any means of communication by which all directors participating in the meeting may simultaneously hear each other during the meeting. Participation by such means shall constitute presence in person at a meeting.

2.15 Compensation. By resolution of the Board of Directors, the directors may be paid their expenses, if any, and may be paid a fixed sum or a stated salary as a director, for attendance at each meeting of the Board of Directors. No such payment shall preclude any director from serving the corporation in any other capacity and receiving compensation therefor.

2.16 Committees. The Board of Directors, by resolution adopted by the greater of (a) a majority of all of the directors in office, or (b) the number of directors required by the Articles of Incorporation or these Bylaws to take action may from time to time create, and appoint individuals to, one or more committees, each of which must have at least two (2) members. If a committee is formed for the purpose of exercising functions of the Board of Directors, the committee must consist solely of directors. If the only function of a committee is to study and make recommendations for action by the full Board of Directors, the committee need not consist of directors. Committees of directors may exercise the authority of the Board of Directors to the

extent specified by such resolution or in the Articles of Incorporation or these Bylaws. However, no committee shall:

(a) authorize or approve a distribution (as defined in RCW 23B.01.400) except according to a general formula or method prescribed by the Board of Directors;

(b) approve or propose to shareholders action that by law is required to be approved by shareholders;

(c) fill vacancies on the Board of Directors or on any of its committees;

(d) amend the Articles of Incorporation;

(e) adopt, amend, or repeal Bylaws;

(f) approve a plan of merger not requiring shareholder approval; or

(g) authorize or approve the issuance or sale or contract for sale of shares, or determine the designation and relative rights, preferences, and limitations of a class or series of shares, except that the Board of Directors may authorize a committee of directors (or a senior executive officer of the corporation) to do so within limits specifically prescribed by the Board of Directors.

Committees shall be governed by the same provisions as govern the meetings, actions without meetings, notice and waiver of notice, quorum and voting requirements, and standards of conduct of the Board of Directors. The Executive Committee (if one be established) shall meet periodically between meetings of the full Board of Directors. All committees shall keep regular minutes of their meetings and shall cause them to be recorded in books kept for that purpose at the office of the corporation.

ARTICLE III

OFFICERS

3.1 Appointment. The officers of the corporation shall be appointed annually by the Board of Directors at its annual meeting held after the annual meeting of the shareholders. If the appointment of officers is not held at such meeting, such appointment shall be held as soon thereafter as a Board of Directors meeting conveniently may be held. Except in the case of death, resignation, or removal, each officer shall hold office until the next annual meeting of the Board of Directors and until his or her successor is appointed and qualified.

3.2 Qualification. None of the officers of the corporation need be a director, except as specified below. Any two or more of the corporate offices may be held by the same person.

3.3 Officers Enumerated. Except as otherwise provided by resolution of the Board of Directors, the officers of the corporation and their respective powers and duties shall be as follows:

3.3.1 Chairman of the Board. The Chairman of the Board (if such an officer be appointed) shall be a director and shall perform such duties as shall be assigned to him or her by the Board of Directors and in any employment agreement. The Chairman shall preside at all meetings of the shareholders and at all meetings of the Board of Directors at which he or she is present. The Chairman may sign deeds, mortgages, bonds, contracts, and other instruments, except when the signing thereof has been expressly delegated by the Board of Directors or by these Bylaws to some other officer or agent of the corporation or is otherwise required by law to be signed by some other officer or in some other manner. If the President dies or becomes unable to act, the Chairman shall perform the duties of the President, except as may be limited by resolution of the Board of Directors, with all the powers of and subject to all the restrictions upon the President.

3.3.2 Chief Executive Officer. Subject to the supervisory powers of the Board of Directors, the Chief Executive Officer (if such an officer be appointed) shall be a director and shall perform such duties as shall be assigned to him or her by the Board of Directors and in any employment agreement. The Chief Executive Officer shall have general charge of the business and affairs of the corporation. In the event a Chairman of the Board has not been appointed or, if appointed, is absent or unable to act, the Chief Executive Officer, if a director, shall preside over all meetings of the shareholders and over all meetings of the Board of Directors at which he or she is present unless otherwise provided by the Board of Directors. The Chief Executive Officer shall keep the Board of Directors fully informed and shall freely consult with them concerning the business of the corporation. Except where a President has been appointed, or where a President who has been appointed is absent or unable to act, the Chief Executive Officer shall perform all the functions assigned to a President in these Bylaws and all such other duties as are customarily incident to the office of President. The Chief Executive Officer may sign, with the Secretary or any other officer of the corporation thereunto authorized by the Board of Directors, certificates for shares of the corporation, any deeds, mortgages, bonds, contracts, or other instruments that the Board of Directors has authorized to be executed, except in cases where the signing and execution thereof shall be expressly delegated by the Board of Directors or by these Bylaws to some other officer or agent of the corporation, or shall be required by law to be otherwise signed or executed; and in general shall perform all duties incident to the office of Chief Executive Officer and such other duties as may be prescribed by the Board of Directors from time to time. Notwithstanding anything to the contrary contained in these Bylaws, in the event a Chief Executive Officer has not been appointed, the President shall be the Chief Executive Officer and perform all the functions assigned to a Chief Executive Officer in these Bylaws and all such other duties as are customarily incident to the office of Chief Executive Officer.

3.3.3 President. Subject to such supervisory powers as may be given by the Board of Directors to the Chairman of the Board (if one be appointed) and Chief Executive Officer (if such an officer be appointed), the President shall be the chief executive officer of the corporation unless some other officer is so designated by the Board of Directors and, subject to the control of the Board of Directors and the Executive Committee (if one be established), shall supervise and control all of the assets, business, and affairs of the corporation. The President may sign certificates for shares of the corporation, deeds, mortgages, bonds, contracts, and other

instruments, except when the signing thereof has been expressly delegated by the Board of Directors or by these Bylaws to some other officer or agent of the corporation or is otherwise required by law to be signed by some other officer or in some other manner. The President shall vote the shares owned by the corporation in other corporations, domestic or foreign, unless otherwise prescribed by law or resolution of the Board of Directors. In general, the President shall perform all duties incident to the office of President and such other duties as may be prescribed by the Board of Directors from time to time. In the absence of the Chairman of the Board, and the Chief Executive Officer, the President, if a director, shall preside over all meetings of the shareholders and over all meetings of the Board of Directors at which he or she is present. The President shall have the authority to appoint one or more Assistant Secretaries and Assistant Treasurers, as he or she deems necessary.

3.3.4 Vice Presidents. If no Chairman of the Board or Chief Executive Officer has been appointed, in the absence or disability of the President, the Vice Presidents, if any, in order of their rank as fixed by the Board of Directors or, if not ranked, a Vice President designated by the Board of Directors shall perform all the duties of the President and when so acting shall have all the powers of, and be subject to all the restrictions upon, the President; provided that no such Vice President shall assume the authority to preside as Chairman of meetings of the Board of Directors unless such Vice President is a member of the Board of Directors. The Vice Presidents shall have such other powers and perform such other duties as from time to time may be respectively prescribed for them by the Board of Directors, these Bylaws, the Chief Executive Officer, the President, or the Chairman of the Board (if one be appointed).

3.3.5 Secretary. The Secretary shall:

(a) have responsibility for preparing minutes of meetings of the shareholders and the Board of Directors and for authenticating records of the corporation;

(b) see that all notices are duly given in accordance with the provisions of Sections 1.3, 1.5, 2.8, and 2.10 of these Bylaws and as required by law;

(c) be custodian of the corporate records and seal of the corporation, if one be adopted;

(d) keep a register of the post office address of each shareholder and director;

(e) attest certificates for shares of the corporation;

(f) have general charge of the stock transfer books of the corporation;

(g) when required by law or authorized by resolution of the Board of Directors, sign with the President, or other officer authorized by the President or the Board of Directors, deeds, mortgages, bonds, contracts, and other instruments; and

(h) in general, perform all duties incident to the office of Secretary and such other duties as from time to time may be assigned by the President or the Board of Directors.

In the absence of the Secretary, an Assistant Secretary may perform the duties of the Secretary.

3.3.6 Treasurer. If required by the Board of Directors, the Treasurer shall give a bond for the faithful discharge of his or her duties in such sum and with such surety or sureties as the Board of Directors shall determine. The Treasurer (if one be appointed) shall:

(a) have charge and custody of and be responsible for all funds and securities of the corporation;

(b) receive and give receipts for moneys due and payable to the corporation from any source whatsoever and deposit all such moneys in the name of the corporation in banks, trust companies, or other depositories selected in accordance with the provisions of these Bylaws; and

(c) in general, perform all of the duties incident to the office of Treasurer and such other duties as from time to time may be assigned by the President or the Board of Directors.

In the absence of the Treasurer, an Assistant Treasurer may perform the duties of the Treasurer.

3.3.7 Chief Scientific Officer. The Chief Scientific Officers or each Co-Chief Scientific Officer (if such an officer or officers be appointed) shall perform such duties as shall be assigned to him or her by the Board of Directors and in any employment agreement.

3.4 Delegation. In case of the absence or inability to act of any officer of the corporation and of each person herein authorized to act in his or her place, the Board of Directors may from time to time delegate the powers and duties of such officer to any other officer or other person whom it may select.

3.5 Resignation. Any officer may resign at any time by delivering notice to the corporation. Any such resignation shall take effect at the time the notice is delivered unless the notice specifies a later effective date. Unless otherwise specified therein, acceptance of such resignation by the corporation shall not be necessary to make it effective. Any resignation shall be without prejudice to the rights, if any, of the corporation under any contract to which the officer is a party.

3.6 Removal. Any officer or agent may be removed by the Board of Directors with or without cause. An officer empowered to appoint another officer or assistant officer also has the power with or without cause to remove any officer he or she would have the power to appoint whenever in his or her judgment the best interests of the corporation would be served thereby.

The removal of an officer or agent shall be without prejudice to the contract rights, if any, of the corporation or the person so removed. Appointment of an officer or agent shall not of itself create contract rights.

3.7 Vacancies. A vacancy in any office because of death, resignation, removal, disqualification, creation of a new office, or any other cause may be filled by the Board of Directors for the unexpired portion of the term or for a new term established by the Board of Directors.

3.8 Other Officers and Agents. One or more Vice Presidents and such other officers and assistant officers as may be deemed necessary or advisable may be appointed by the Board of Directors or, to the extent provided in Section 3.3.2 above, by the President. Such other officers and assistant officers shall hold office for such periods, have such authorities, and perform such duties as are provided in these Bylaws or as may be provided by resolution of the Board of Directors. Any officer may be assigned by the Board of Directors any additional title that the Board of Directors deems appropriate. The Board of Directors may delegate to any officer or agent the power to appoint any such assistant officers or agents and to prescribe their respective terms of office, authorities, and duties.

3.9 Compensation. Compensation, if any, for officers and other agents and employees of the corporation shall be determined by the Board of Directors, or by the President or the Chief Executive Officer to the extent such authority may be delegated to him or her by the Board of Directors. No officer shall be prevented from receiving compensation in such capacity by reason of the fact that he or she is also a director of the corporation.

3.10 General Standards for Officers. Officers with discretionary authority shall discharge their duties under that authority in accordance with the same standards of conduct applicable to directors as specified in Section 2.1 above (except for subsection (c) thereof).

ARTICLE IV

CONTRACTS, CHECKS AND DRAFTS

4.1 Contracts. The Board of Directors may authorize any officer or officers or agent or agents to enter into any contract or execute and deliver any instrument in the name of and on behalf of the corporation. Such authority may be general or confined to specific instances.

Subject to the limitations set forth in RCW 23B.08.700 through 23B.08.730 and 23B.19.040, to the extent applicable:

(a) The corporation may enter into contracts and otherwise transact business as vendor, purchaser, lender, borrower, or otherwise with its directors and shareholders and with corporations, associations, firms, and entities in which they are or may be or become interested as directors, officers, shareholders, members, or otherwise.

(b) Any such contract or transaction shall not be affected or invalidated or give rise to liability by reason of the director's or shareholder's having an interest in the contract or transaction.

4.2 Checks, Drafts, Etc. All checks, drafts, and other orders for the payment of money, notes, and other evidences of indebtedness issued in the name of the corporation shall be signed by such officer or officers or agent or agents of the corporation and in such manner as may be determined from time to time by resolution of the Board of Directors.

4.3 Deposits. All funds of the corporation not otherwise employed shall be deposited from time to time to the credit of the corporation in such banks, trust companies, or other depositories as the Treasurer, subject to the direction of the Board of Directors, may select.

ARTICLE V

STOCK

5.1 Issuance of Shares. No shares of the corporation shall be issued unless authorized by the Board of Directors, which authorization shall include the maximum number of shares to be issued, the consideration to be received for each share, and, if the consideration is in a form other than cash, the determination of the value of the consideration.

5.2 Certificates of Stock. All shares of the corporation shall be represented by certificates in such form, not inconsistent with the Articles of Incorporation, as the Board of Directors may from time to time prescribe. Certificates of stock shall be issued in numerical order, and each shareholder shall be entitled to a certificate signed by the Chief Executive Officer, the President or a Vice President, attested to by the Secretary or an Assistant Secretary, and sealed with the corporate seal, if any. If any certificate is manually signed by a transfer agent or a transfer clerk and by a registrar, the signatures of the Chief Executive Officer, President, Vice President, Secretary or Assistant Secretary upon that certificate may be facsimiles that are engraved or printed. If any person who has signed or whose facsimile signature has been placed on a certificate no longer is an officer when the certificate is issued, the certificate may nevertheless be issued with the same effect as if the person were still an officer at the time of its issue. Every certificate of stock shall state:

(a) The state of incorporation;

(b) The name of the registered holder of the shares represented thereby;

(c) The number and class of shares, and the designation of the series, if any, which such certificate represents;

(d) If the corporation is authorized to issue different classes of shares or different series within a class, either a summary of (on the face or back of the certificate), or a statement that the corporation will furnish to any shareholder upon written request and without charge a summary of, the designations, relative rights, preferences, and limitations applicable to each class and the variations in rights, preferences and limitations determined for each series, and the authority of the Board of Directors to determine variations for future series; and

(e) If the shares are subject to transfer or other restrictions under applicable securities laws or contracts with the corporation, either a complete description of or a reference to the existence and general nature of such restrictions on the face or back of the certificate.

5.3 Stock Records. The corporation or its agent shall maintain at the registered office or principal office of the corporation, or at the office of the transfer agent or registrar of the corporation, if one be designated by the Board of Directors, a record of its shareholders, in a form that permits preparation of a list of the names and addresses of all shareholders in alphabetical order by class of shares showing the number and class of shares held by each. The person in whose name shares stand on the books of the corporation shall be deemed by the corporation to be the owner thereof for all purposes.

5.4 Restrictions on Transfer. The Board of Directors shall have the authority to issue shares of the capital stock of this corporation and the certificates therefor subject to such transfer restrictions and other limitations as it may deem necessary to promote compliance with applicable federal and state securities laws, and to regulate the transfer thereof in such manner as may be calculated to promote such compliance or to further any other reasonable purpose. Except to the extent that the corporation has obtained an opinion of counsel acceptable to the corporation that transfer restrictions are not required under applicable securities laws, all certificates representing shares of the corporation shall bear the following legend (or a legend of substantially the same import) on the face of the certificate or on the reverse of the certificate if a reference to the legend is contained on the face:

NOTICE: RESTRICTIONS ON TRANSFER

The securities represented by this certificate have not been registered under the Securities Act of 1933, or any state securities laws, and may not be offered, sold, transferred, encumbered, or otherwise disposed of except upon satisfaction of certain conditions. Information concerning these restrictions may be obtained from the corporation or its legal counsel. Any offer or disposition of these securities without satisfaction of said conditions will be wrongful and will not entitle the transferee to register ownership of the securities with the corporation.

5.5 Transfers. Shares of stock may be transferred by delivery of the certificates therefor, accompanied by:

(a) an assignment in writing on the back of the certificate, or an assignment separate from certificate, or a written power of attorney to sell, assign, and transfer the same, signed by the record holder of the certificate; and

(b) such additional documents, instruments, and other items of evidence as may be reasonably necessary to satisfy the requirements of any transfer restrictions applicable to such shares, whether arising under applicable securities or other laws, or by contract, or otherwise.

Except as otherwise specifically provided in these Bylaws, no shares of stock shall be transferred on the books of the corporation until the outstanding certificate therefor has been surrendered to the corporation. All certificates surrendered to the corporation for transfer shall be canceled, and no new certificate shall be issued until the former certificate for a like number of shares shall have been surrendered and canceled, except that, in case of a lost, destroyed, or mutilated certificate, a new one may be issued therefor upon such terms (including indemnity to the corporation) as the Board of Directors may prescribe.

ARTICLE VI

RECORDS OF CORPORATE MEETINGS

The corporation shall keep, as permanent records, minutes of all meetings of its shareholders and Board of Directors, a record of all actions taken by the shareholders or Board of Directors without a meeting, and a record of all actions taken by a committee of the Board of Directors exercising the authority of the Board of Directors on behalf of the corporation. The corporation shall keep at its principal office a copy of the minutes of all shareholders' meetings that have occurred, and records of all action taken by shareholders without a meeting, within the past three (3) years. Any person dealing with the corporation may rely upon a copy of any of the records of the proceedings, resolutions, or votes of the Board of Directors or shareholders when certified by the President or Secretary.

ARTICLE VII

FINANCIAL MATTERS

The corporation shall maintain appropriate accounting records at its principal office and shall prepare the annual financial statements required by RCW 23B.16.200. Except to the extent otherwise expressly determined by the Board of Directors or otherwise required by law, the accounting records of the corporation shall be kept and prepared in accordance with generally accepted accounting principles applied on a consistent basis from period to period. The fiscal year of the corporation shall be the calendar year unless otherwise expressly determined by the Board of Directors.

ARTICLE VIII

DISTRIBUTIONS

The Board of Directors may from time to time authorize, and the corporation may make, distributions (as defined in RCW 23B.01.400) to its shareholders to the extent permitted by RCW 23B.06.400, subject to any limitation in the Articles of Incorporation. A director who votes for or assents to a distribution made in violation of RCW 23B.06.400 is personally liable to

the corporation for the amount of the distribution that exceeds that which could have been distributed without violating RCW 23B.06.400 if it is established that the director did not perform the director's duties in compliance with Section 2.1 above.

ARTICLE IX

CORPORATE SEAL

The Board of Directors may, but shall not be required to, adopt a corporate seal for the corporation in such form and with such inscription as the Board of Directors may determine. If such a corporate seal shall at any time be so adopted, the application of or the failure to apply such seal to any document or instrument shall have no effect upon the validity or invalidity of such document or instrument under otherwise applicable principles of law.

ARTICLE X

MISCELLANY

10.1 Communications by Facsimile. Whenever these Bylaws require notice, consent, or other communication to be delivered for any purpose, transmission by phone, wire, wireless equipment or electronic mail which transmits a facsimile of such communication shall constitute sufficient delivery for such purpose, provided that in the case of electronic mail, such notice is delivered to the recipient at the address designated by such recipient in a consent to receive electronic notice. Such communication shall be deemed to have been received by or in the possession of the addressee upon completion of the transmission.

10.2 Inspector of Elections. Before any annual meeting of shareholders, the Board of Directors may appoint an inspector of elections to act at the meeting and any adjournment thereof. If no inspector of elections is so appointed by the Board of Directors, then the chairman of the meeting may appoint an inspector of elections to act at the meeting. If any person appointed as inspector fails to appear or fails or refuses to act, then the chairman of the meeting may, and upon the request of any shareholder or a shareholder's proxy shall, appoint a person to fill that vacancy.

Such inspector of elections shall:

(a) determine the number of shares outstanding and the voting power of each, the number of shares represented at the meeting, the existence of a quorum, and, with the advice of legal counsel to the corporation, the authenticity, validity, and effect of proxies pursuant to RCW 23B.07.220 and 23B.07.240 and any procedure adopted by the Board of Directors pursuant to RCW 23B.07.230;

(b) receive votes, ballots, or consents;

(c) hear and determine all challenges and questions in any way arising in connection with the right to vote;

(d) count and tabulate all votes or consents;

(e) determine the result; and

(f) do any other acts that may be proper to conduct the election or vote with fairness to all shareholders.

10.3 Rules of Order. The rules contained in the most recent edition of Robert's Rules of Order, Revised, shall govern all meetings of shareholders and directors where those rules are not inconsistent with the Articles of Incorporation or Bylaws, subject to the following:

(a) The chairman of the meeting shall have absolute authority over matters of procedure, and there shall be no appeal from the ruling of the chairman. If the chairman in his or her absolute discretion deems it advisable to dispense with the rules of parliamentary procedure for any meeting or any part thereof, the chairman shall so state and shall clearly state the rules under which the meeting or appropriate part thereof shall be conducted.

(b) If disorder should arise which prevents continuation of the legitimate business of the meeting, the chairman may quit the chair and announce the adjournment of the meeting; upon so doing, the meeting shall be deemed immediately adjourned, subject to being reconvened in accordance with Section 1.5 of these Bylaws, as the case may be.

(c) The chairman may ask or require that anyone not a bona fide shareholder or proxy leave the meeting of shareholders.

(d) A resolution or motion at a meeting of shareholders shall be considered for vote only if proposed by a shareholder or duly authorized proxy and seconded by an individual who is a shareholder or duly authorized proxy other than the individual who proposed the resolution or motion.

10.4 Construction. Within these Bylaws, words of any gender shall be construed to include any other gender, and words in the singular or plural number shall be construed to include the plural or singular, respectively, unless the context otherwise requires.

10.5 Severability. If any provision of these Bylaws or any application thereof shall be invalid, unenforceable, or contrary to applicable law, the remainder of these Bylaws, and the application of such provisions to individuals or circumstances other than those as to which it is held invalid, unenforceable, or contrary to applicable law, shall not be affected thereby.

ARTICLE XI

AMENDMENT OF BYLAWS

Subject to the requirements of RCW 23B.10.210 relating to supermajority quorum provisions for the Board of Directors, if applicable, the Bylaws of the corporation may be amended or repealed, or new Bylaws may be adopted, by: (a) the shareholders, even though the Bylaws may also be amended or repealed, or new Bylaws may also be adopted, by the Board of

Directors; or (b) subject to the power of the shareholders of the corporation to change or repeal the Bylaws, the Board of Directors, unless such power is reserved, by the Articles of Incorporation or by law, exclusively to the shareholders in whole or in part or unless the shareholders, in amending or repealing a particular bylaw, provide expressly that the Board of Directors may not amend or repeal that bylaw. Any officer of the corporation may authenticate a restatement of the Bylaws and all amendments thereto adopted in the manner provided above.

Exhibit 4.1

ADAPTIVE BIOTECHNOLOGIES CORPORATION

SEVENTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT

May 30, 2019

SEVENTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT

THIS SEVENTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT (this "**Agreement**") is made as of May 30, 2019, by and between (i) Adaptive Biotechnologies Corporation, a Washington corporation (the "**Company**"), (ii) each of the investors listed on Schedule A hereto, each of whom is referred to in this Agreement as an "**Investor**," and (iii) solely for purposes of Sections 5 and 6 hereof, each of Chad Robins and Harlan Robins and their permitted transferees (the "**Key Holders**").

RECITALS

A. The Company and certain Investors are party to the Sixth Amended and Restated Investors' Rights Agreement, dated as of December 11, 2017 (the "**Prior IRA**").

B. This Agreement amends and restates in its entirety the Prior IRA.

NOW, THEREFORE, in consideration of the mutual covenants of the parties herein and other good and valuable consideration, the parties agree as follows:

AGREEMENT

1. Definitions. For purposes of this Agreement:

1.1 "**Affiliate**" means, with respect to any specified Person, any other Person who or which, directly or indirectly, controls, is controlled by, or is under common control with such specified Person, including without limitation any partner, officer, director, manager or employee of such Person and any venture capital fund now or hereafter existing that is controlled by or under common control with one or more general partners or managing members of, or shares the same management company with, such Person.

1.2 "**Amended Articles**" means the Company's Amended and Restated Articles of Incorporation as filed on or about the date of this Seventh Amended and Restated Investors' Rights Agreement.

1.3 "**Common Stock**" means shares of the Company's common stock, no par value per share.

1.4 "**Damages**" means any loss, claim, damage, or liability (joint or several) to which a party hereto may become subject, insofar as such loss, claim, damage, or liability (or any action in respect thereof) arises out of or is based upon (i) any untrue statement or alleged untrue statement of a material fact contained in any registration statement of the Company, including any preliminary prospectus or final prospectus contained therein, any amendments or supplements thereto or any documents incorporated by reference therein; (ii) an omission or alleged omission to state therein a material fact required to be stated therein, or necessary to make the statements therein not misleading; or (iii) any violation or alleged violation by any other party hereto of the Securities Act, the Exchange Act, any state securities law, or any rule or regulation promulgated under the Securities Act, the Exchange Act, or any state securities law.

1.5 "**Exchange Act**" means the Securities Exchange Act of 1934, as amended, and the rules and regulations promulgated thereunder.

1.6 "**Excluded Registration**" means a registration relating either to the sale of securities to employees of the Company pursuant to a stock option, stock purchase, or similar plan or to an SEC Rule 145 transaction; a registration on any form that does not include substantially the same information as would be required to be included in a registration statement covering the sale of the Registrable Securities; or a registration in which the only Common Stock being registered is Common Stock issuable upon conversion of debt securities that are also being registered.

1.7 "**GAAP**" means generally accepted accounting principles in the United States.

1.8 "**Holder**" means any holder of Registrable Securities who is a party to this Agreement.

1.9 "**Immediate Family Member**" means a child, stepchild, grandchild, parent, stepparent, grandparent, spouse, sibling, mother-in-law, father-in-law, son-in-law, daughter-in-law, brother-in-law, or sister-in-law, including adoptive relationships, of a natural person referred to herein.

1.10 "**Initiating Holders**" means, collectively, Holders who properly initiate a registration request under this Agreement.

1.11 "**IPO**" means the Company's first underwritten public offering of its Common Stock for cash pursuant to an effective registration statement (other than on Form S-4, S-8 or a comparable form) under the Securities Act.

1.12 "**Major Investor**" means any Investor that, individually or together with such Investor's Affiliates, holds at least 550,000 shares of Registrable Securities (as adjusted for any stock dividends, splits, combinations, recapitalizations, reclassifications or the like effected after the date hereof with respect to such securities).

1.13 "**Material Adverse Change**" means (i) any general suspension of trading in, or limitation on prices for, securities on any national securities exchange or in the over-the-counter market in the United States; (ii) the declaration of a banking moratorium or any suspension of payments in respect of banks in the United States; (iii) a material outbreak or escalation of armed hostilities or other international or national calamity involving the United States or the declaration by the United States of a national emergency or war or a change in national or international financial, political or economic conditions; and (iv) any event, change, circumstance or effect that is or is reasonably likely to be materially adverse to the business, properties, assets, liabilities, condition (financial or otherwise), operations, results of operations or prospects of the Company.

1.14 "**New Securities**" means, collectively, equity securities of the Company, whether or not currently authorized, as well as rights, options, or warrants to purchase such equity securities, or securities of any type whatsoever that are, or may become, convertible or exchangeable into or exercisable for such equity securities.

1.15 "**Person**" means any individual, corporation, partnership, trust, limited liability company, association or other entity.

1.16 "**Preferred Stock**" means shares of the Series A Preferred Stock, the Series B Preferred Stock, the Series C Preferred Stock, the Series D Preferred Stock, the Series E Preferred Stock, the Series E-1 Preferred Stock, the Series F Preferred Stock and the Series F-1 Preferred Stock.

1.17 "**Register**," "**registered**," and "**registration**" refer to a registration effected by preparing and filing a registration statement or similar document in compliance with the Securities Act, and the declaration or ordering of effectiveness of such registration statement or document.

1.18 "**Registrable Securities**" means (i) the Common Stock issuable or issued upon conversion of the Preferred Stock, and (ii) any Common Stock issued as (or issuable upon the conversion or exercise of any warrant, right, or other security that is issued as) a dividend or other distribution with respect to, or in exchange for or in replacement of, the shares referenced in clause (i) above; excluding in all cases, however, any Registrable Securities sold by a Person in a transaction in which the rights under Section 2 hereof are not assigned or any shares for which registration rights have terminated pursuant to Section 2.15 of this Agreement.

1.19 "**Registrable Securities then outstanding**" means the number of shares determined by adding the Common Stock outstanding and the Common Stock issuable pursuant to then exercisable or convertible securities that are Registrable Securities.

1.20 "**Restricted Securities**" means the securities of the Company required to bear the legend set forth in Section 2.14(b) hereof.

1.21 "**SEC**" means the U.S. Securities and Exchange Commission.

1.22 "**SEC Rule 144**" means Rule 144 promulgated by the SEC under the Securities Act.

1.23 "**SEC Rule 145**" means Rule 145 promulgated by the SEC under the Securities Act.

1.24 "**Securities Act**" means the Securities Act of 1933, as amended, and the rules and regulations promulgated thereunder.

1.25 "**Selling Expenses**" means all underwriting discounts, selling commissions, and stock transfer taxes applicable to the sale of Registrable Securities, and fees and disbursements of counsel for any Holder, except as provided in Section 2.7.

1.26 "**Series A Preferred Stock**" means shares of the Company's Series A Preferred Stock.

1.27 "**Series B Preferred Stock**" means shares of the Company's Series B Preferred Stock.

1.28 "**Series C Preferred Stock**" means shares of the Company's Series C Preferred Stock.

1.29 "**Series D Preferred Stock**" means shares of the Company's Series D Preferred Stock.

1.30 "**Series E Preferred Stock**" means shares of the Company's Series E Preferred Stock.

1.31 "**Series E-1 Preferred Stock**" means shares of the Company's Series E-1 Preferred Stock.

1.32 "**Series F Preferred Stock**" means shares of the Company's Series F Preferred Stock.

1.33 "**Series F-1 Preferred Stock**" means shares of the Company's Series F-1 Preferred Stock.

1.34 "**Shelf Registration Statement**" means a registration statement of the Company filed with the SEC on either (i) Form S-3 (or any successor form or other appropriate form under the Securities Act) or (ii) if the Company is not permitted to file a registration statement on Form S-3, an evergreen registration statement on Form S-1 (or any successor form or other appropriate form under the Securities Act), in each case for an offering to be made on a continuous or delayed basis pursuant to Rule 415 under the Securities Act (or any similar rule that may be adopted by the SEC) covering all or any portion of the Registrable Securities, as applicable. To the extent that the Company is a "well-known seasoned issuer" (as such term is defined in Rule 405 (or any successor or similar rule) of the Securities Act), a "Shelf Registration Statement" shall be deemed to refer to an "automatic shelf registration statement," as such term is defined in Rule 405 (or any successor or similar rule) of the Securities Act.

1.35 "**Viking**" means, Viking Global Investors LP, or any of its Affiliates or successors.

2. Registration Rights. The Company covenants and agrees as follows:

2.1 Demand Registration.

(a) If at any time after the expiration of six months following the closing date of the IPO, the Company receives a request from (i) Holders of thirty percent (30%) of the Registrable Securities then outstanding or (ii) Viking, so long as it remains a Major Investor, that the Company effect a registration with respect to the Registrable Securities then outstanding having an anticipated aggregate offering price to the public of not less than $5 million, then the Company shall use its best efforts to: (i) within ten (10) days after the date such request is given, give notice thereof (the "**Demand Notice**") to all Holders other than the Initiating Holders; and (ii) file a registration statement on Form S-1 or any similar long-form registration statement (a "**Long-Form Registration Statement**") or, if available, a registration statement on Form S-3 or any similar short-form registration statement (a "**Short-Form Registration Statement**"), other than a Shelf Registration Statement, as soon as practicable, and in any event within sixty (60) days after the date such request is given by the Initiating Holders, in the case of a Long-Form Registration Statement or within thirty (30) days after the date such request is given by the Initiating Holders, in the case of a Short-Form Registration Statement, in each case covering all Registrable Securities that the Initiating Holders requested to be registered and any additional Registrable Securities requested to be included in such registration by any other Holders, as specified by notice given by each such Holder to the Company within twenty (20) days of the date the Demand Notice is given, and in each case, subject to the limitations of Section 2.1(b).

(b) If the Company qualifies to use a Short-Form Registration Statement after the date that a Long-Form Registration Statement is filed or declared effective, the Company may convert such Long-Form Registration Statement into a Short-Form Registration Statement.

(c) Notwithstanding the foregoing obligations, if the Company furnishes to Holders requesting a registration pursuant to this Section 2.1 a certificate signed by the Company's Chairman of the Board stating that in the good faith judgment of the Company's Board of Directors, after consultation with outside counsel to the Company, it would be materially detrimental to the Company and its shareholders for such registration statement to either become effective or remain effective for as long as such registration statement otherwise would be required to remain effective, then the Company shall have the right, upon giving prompt written notice of such action to the Holders, to defer taking action with respect to such filing, and any time periods with respect to filing or effectiveness thereof shall be tolled correspondingly, for a period of not more than sixty (60) days after the request of the Initiating Holders is given; provided, however, that the Company may not invoke this right or the right under Section 2.3(b) (A) more than once in any twelve (12)-month period; or (B) for an aggregate period exceeding ninety (90) days in any twelve (12)-month period.

(d) The Company shall not be obligated to effect, or to take any action to effect, any registration pursuant to this Section 2.1 (i) during the period that is thirty (30) days before the Company's good faith estimate of the date of filing of, and ending on a date that is sixty (60) days after the effective date of, a registration statement pertaining to an underwritten public offering of the Company's securities, and (ii) after the Company has effected five (5) registrations pursuant to Section 2.1 if the Initiating Holders for at least two (2) of such registrations shall have been Viking or its Affiliates. A registration shall not be counted as "effected" for purposes of this Section 2.1 until such time as the applicable registration statement has been declared effective by the SEC and remains effective for not less than one hundred and twenty (120) days without any occurrence of a Material Adverse Change (or such shorter period as shall terminate when all Registrable Securities covered thereunder have been sold), unless the Initiating Holders withdraw their request for such registration, elect not to reimburse the Company for the registration expenses therefor, and forfeit their right to one demand registration statement pursuant to Section 2.7, in which case such withdrawn registration statement shall be counted as "effected" for purposes of this Section 2.1.

2.2 Company Registration. If the Company proposes to register (including, for this purpose, a registration effected by the Company for shareholders other than the Holders) any of its stock or other securities under the Securities Act in connection with the public offering of such securities solely for cash (other than an Excluded Registration), the Company shall, at such time, promptly (but in no event less than forty five (45) days prior to the proposed date of filing of such registration statement), give each Holder notice of such registration. Upon the request of each Holder given within twenty (20) days after such notice is given by the Company, the Company shall, subject to the provisions of Section 2.4, cause to be registered all of the Registrable Securities that each such Holder has requested to be included in such registration. The Company shall have the right to terminate or withdraw any registration initiated by it under this Section 2.2 before the effective date of such registration, whether or not any Holder has elected to include Registrable Securities in such registration. The expenses of such withdrawn registration shall be borne by the Company in accordance with Section 2.7.

2.3 Shelf Registration. If at any time after the expiration of six months following the closing date of the IPO, the Company receives a request from (i) Holders of at least twenty percent (20%) of the Registrable Securities then outstanding, (ii) Viking, so long as it remains a Major Investor, that the Company file with the SEC a Shelf Registration Statement with respect to all or a part of the Registrable Securities owned by such Initiating Holders, then the Company shall:

(a) within ten (10) days after the date such request is given, give notice of the proposed registration to all Holders other than the Initiating Holders (the "**Shelf Notice**"); and

(b) as soon as practicable, use its commercially reasonable efforts to effect such registration as would permit or facilitate the sale and distribution from time to time of all or such portion of such Initiating Holders' Registrable Securities as are specified in such request, together with all or such portion of the Registrable Securities of any other Holders joining in such request as are specified in a request given to the Company within fifteen (15) days after the Shelf Notice is given;

(c) provided, however, that the Company shall not be obligated to file a Shelf Registration Statement pursuant to this Section 2.3 (i) if the Holders, together with the holders of any other securities of the Company entitled to and requesting inclusion in such registration, propose to sell Registrable Securities and such other securities (if any) at an aggregate offering price to the public (net of Selling Expenses) of less than $2 million; or (ii) if the Company furnishes to the Holders a certificate signed by the Chairman of the Board of the Company stating that in the good-faith judgment of the Board of Directors of the Company, after consultation with outside counsel to the Company, it would be materially detrimental to the Company and its shareholders for such Shelf Registration Statement to be effected at such time, in which event the Company shall have the right, upon giving prompt written notice of such action to the Holders, to defer the filing of the Shelf Registration Statement for a period of not more than sixty (60) days after receipt of the request of the Initiating Holders under this Section 2.3; provided, however, that the Company shall not invoke this right or the right under Section 2.1(c) (A) more than once in any twelve (12) month period; (B) for an aggregate period exceed ninety (90) days in any twelve (12) month period; or (C) during the period ending sixty (60) days after the effective date of a registration made under Section 2.2 hereof. Registrations effected pursuant to this Section 2.3 shall not be counted as demands for registration or registrations effected pursuant to Section 2.1.

2.4 An offering or sale of Registrable Securities pursuant to a Shelf Registration Statement (each, a "**Shelf Take-Down**") may be initiated at any time by one or more Major Investors; provided, that the minimum market value of Registrable Securities that such Holder(s) (the "**Initiating Shelf Take-Down Holders**") propose to sell in such offering must be, on the date such Holder submits its written request to the Company, equal to at least (A) $1 million or (B) such lower amount approved by the Board; provided that, if the Board approves any such lower amount, it shall be applicable to all Holders. The Initiating Shelf Take-Down Holders shall not be required to permit the offer and sale of Registrable Securities by other Shelf Holders in connection with any such Shelf Take-Down initiated by the Initiating Shelf Take-Down Holders and no Shelf Holder other than the Initiating Shelf Take-Down Holder(s) shall be entitled to offer or sell any Registrable Securities pursuant to such Shelf Take-Down.

2.5 Underwriting Requirements.

(a) Any registration pursuant to Section 2.1 shall be firmly underwritten. If, pursuant to Section 2.3, the Initiating Holders intend to distribute the Registrable Securities covered by a Shelf Take-Down by means of an underwriting, the Initiating Holders shall so advise the Company as a part of their request made pursuant to Section 2.3, and the Company shall amend or supplement the Shelf Registration Statement for such purpose as soon as practicable. Any underwriter of an offering required to be registered under Section 2.1 or 2.3 shall be selected by the Company, shall be of nationally recognized standing, and shall be reasonably acceptable to a majority in interest of the Initiating Holders. In such event, any right of any Holder to include such Holder's Registrable Securities in such registration shall be conditioned upon such Holder's participation in such underwriting and the inclusion of such Holder's Registrable Securities in the underwriting to the extent provided herein. All Holders proposing to distribute their securities through such underwriting shall (together with the Company as provided in Section 2.5(e)) enter into an underwriting agreement in customary form with the managing underwriter(s) selected for such underwriting; provided that the aggregate amount of the liability of any Holder thereunder shall not exceed such Holder's gross proceeds from such underwriting (less Selling Expenses). Notwithstanding any other provision of this Section 2.4, if the managing underwriter(s) advise(s) the Initiating Holders in writing that marketing factors require a limitation on the number of shares to be underwritten, then the Initiating Holders shall so advise all Holders of Registrable Securities that otherwise would be underwritten pursuant hereto, and the number of Registrable Securities that may be included in the underwriting shall be allocated among all Holders of Registrable Securities, including the Initiating Holders, in proportion (as nearly as practicable) to the number of Registrable Securities of the Company owned by each Holder; provided, however, that the number of Registrable Securities held by the Holders to be included in such underwriting shall not be reduced unless all other securities are first entirely excluded from the underwriting. To facilitate the allocation of shares in accordance with the above provisions, the Company or the underwriters may round the number of shares allocated to any Holder to the nearest 100 shares.

(b) In connection with any offering involving an underwriting of shares of the Company's capital stock pursuant to Section 2.2, the Company shall not be required to include any of the Holders' Registrable Securities in such underwriting unless the Holders accept the customary terms of the underwriting as agreed upon between the Company and its underwriters, and then only in such quantity as the underwriters in their sole discretion determine will not jeopardize the success of the offering by the Company.

(c) If the total number of securities, including Registrable Securities, to be included in such offering exceeds the number of securities to be sold that the underwriters in their reasonable discretion determine is compatible with the success of the offering, then the Company shall be required to include in the offering only that number of such securities, including Registrable Securities, which the underwriters and the Company in their sole discretion determine will not jeopardize the success of the offering. If the underwriters determine that less than all of the Registrable Securities requested to be registered can be included in such offering, then the Registrable Securities that are included in such offering shall be allocated (i) in the case of the IPO, (A) first to the Company, (B) second, and only if all of the securities referred to in clause (A) have been included, to Viking and its Affiliates with respect to any Registrable Securities owned by them (as allocated by Viking) and (C) third, and only if all of the securities referred to in clause (B) have been included, apportioned pro rata among the other selling Holders based on the number of Registrable Securities held by all such selling Holders or in such other proportions as shall mutually be agreed to by all such selling Holders and (ii) in the case of any other offering, (A) first to the Company and (B) second, and only if all of the securities referred to in clause (A) have been included, pro rata among the other selling Holders based on the number of Registrable Securities held by all such selling Holders or in such other proportions as shall mutually be agreed to by all such selling Holders; provided, however, that the number of Registrable Securities held by any Holder to be included in such underwriting shall not be reduced unless all securities held by Persons other than the Company and the Holders are first entirely excluded from the underwriting. For purposes of the provision in this Section 2.4(b) concerning apportionment, for any selling shareholder that is a Holder and a partnership, limited liability company, or corporation, the partners, members, retired partners, retired members, shareholders, and Affiliates of such Holder, or the estates and Immediate Family Members of any such partners, retired partners, members, and retired members and any trusts for the benefit of any of the foregoing Persons, shall be deemed to be a single "selling Holder," and any pro rata reduction with respect to such "selling Holder" shall be based upon the aggregate number of Registrable Securities owned by all Persons included in such "selling Holder," as defined in this sentence.

2.6 Obligations of the Company. Whenever required under this Section 2 to effect the registration of any Registrable Securities, the Company shall, as expeditiously as reasonably possible:

(a) prepare and file with the SEC a registration statement with respect to such Registrable Securities and use its commercially reasonable efforts to cause such registration statement to become effective and, upon the request of the Holders of a majority of the Registrable Securities registered thereunder, keep such registration statement effective for a period of up to one hundred twenty (120) days or, if earlier, until the distribution contemplated in the registration statement has been completed; provided, however, that (i) such one hundred twenty (120) day period shall be extended for a period of time equal to the period the Holder refrains, at the request of an underwriter of Common Stock (or other securities) of the Company, from selling any securities included in such registration, and (ii) in the case of any registration of Registrable Securities on a Shelf Registration Statement that are intended to be offered on a continuous or delayed basis, subject to compliance with applicable SEC rules, such one hundred twenty (120) day period shall be extended for up to three (3) years, if necessary, to keep the registration statement effective until all such Registrable Securities are sold;

(b) prepare and file with the SEC such amendments and supplements to such registration statement, and the prospectus used in connection with such registration statement, as may be (x) reasonably request by any Major Investor or (y) necessary to comply with the Securities Act in order to enable the disposition of all securities covered by such registration statement;

(c) furnish to the selling Holders, without charge, such numbers of copies of a prospectus, including a preliminary prospectus, and any amendment or supplement thereto as required by the Securities Act, and such other documents as the Holders may reasonably request in order to facilitate their disposition of their Registrable Securities;

(d) use its commercially reasonable efforts to register and qualify the securities covered by such registration statement under such other securities or blue-sky laws of such jurisdictions as shall be reasonably requested by the selling Holders; provided, that the Company shall not be required to qualify to do business or to file a general consent to service of process in any such states or jurisdictions, unless the Company is already subject to service in such jurisdiction and except as may be required by the Securities Act;

(e) in the event of any underwritten public offering, enter into and perform its obligations under an underwriting agreement, in usual and customary form, with the managing underwriter of such offering and take all such other actions as any Major Investor or the managing underwriter reasonably requests in order to expedite or facilitate the registration and disposition of the Registrable Securities;

(f) use its commercially reasonable efforts to cause all such Registrable Securities covered by such registration statement to be listed or quoted on a national securities exchange or trading or quotation system and each securities exchange and trading or quotation system (if any) on which similar securities issued by the Company are then listed;

(g) provide a transfer agent and registrar for all Registrable Securities registered pursuant to this Agreement and provide a CUSIP number for all such Registrable Securities, in each case not later than the effective date of such registration;

(h) promptly make available for inspection by the selling Holders, any managing underwriter participating in any disposition pursuant to such registration statement, and any attorney or accountant or other agent retained by any such underwriter or selected by the selling Holders, all financial and other records, pertinent corporate documents, and properties of the Company, and cause the Company's officers, directors, employees, and independent accountants to supply all information reasonably requested by any such seller, underwriter, attorney, accountant, or agent in connection with any such registration statement;

(i) obtain for delivery to the underwriter or underwriters, if any, with copies to the selling Holders, an opinion or opinions from counsel for the Company dated the effective date of the registration statement, or in the event of an underwritten offering, the date of the closing under the underwriting agreement, in customary form, scope and substances, which opinions shall be reasonably satisfactory to such Holder or underwriters and their respective counsel;

(j) in the case of an underwritten offering, obtain for delivery to the Company and the managing underwriter or underwriters, with copies to the selling Holders, a cold comfort letter from the Company's independent accountants in customary form and covering such matters of the type customarily covered by cold comfort letters as the managing underwriter or underwriters may reasonably request, dated the date of execution of the underwriting agreement and brought down to the closing under the underwriting agreement;

(k) in the case of an underwritten offering, cause the senior executive officers of the Company to participate in the customary "road show" presentations that may be reasonably requested by the managing underwriter or underwriters in any such offering and otherwise to facilitate, cooperate with and participate in each proposed offering contemplated herein and customary selling efforts related thereto;

(l) notify each selling Holder, promptly after the Company receives notice thereof, of the time when such registration statement has been declared effective or a supplement to any prospectus forming a part of such registration statement has been filed;

(m) after such registration statement becomes effective, notify each selling Holder of any written comments by the SEC or request by the SEC that the Company amend or supplement such registration statement or prospectus or of the issuance by the SEC of any stop order suspending the effectiveness of such registration statement;

(n) notify each selling Holder and any managing underwriter if it becomes aware of the happening of any event as a result of which the registration statement contains any untrue statement of a material fact or omits to state a material fact necessary to make the statements therein not misleading; and

(o) cooperate with each selling Holder and any managing underwriter, if any, to facilitate the timely preparation and delivery of certificates representing Registrable Securities to be sold and not bearing any restrictive legends.

2.7 Furnish Information. It shall be a condition precedent to the obligations of the Company to take any action pursuant to this Section 2 with respect to the Registrable Securities of any selling Holder that such Holder shall furnish to the Company such information regarding itself, the Registrable Securities held by it, and the intended method of disposition of such securities as is reasonably required to effect the registration of such Holder's Registrable Securities.

2.8 Expenses of Registration. All expenses (other than Selling Expenses) incurred in connection with registrations, filings, or qualifications pursuant to Section 2, including all registration, filing, and qualification fees; printers' and accounting fees; fees and disbursements of counsel for the Company; and the reasonable fees and disbursements, not to exceed $100,000 or such greater amount as agreed upon in the applicable underwriting agreement, of one counsel for the selling Holders, which counsel shall be selected by the Holder that, together with its affiliates, is offering to sell the greatest number of Registrable Securities in such offering, shall be borne and paid by the Company; provided, however, that the Company shall not be required to pay for any expenses of any registration proceeding begun pursuant to Section 2.1 or Section 2.3 if the registration request is subsequently withdrawn at the request of the Holders of a majority of the Registrable Securities to be registered (in which case all selling Holders shall bear such expenses pro rata based upon the number of Registrable Securities that were to be included in the withdrawn registration), unless the withdrawal is made following the occurrence of a Material Adverse Change. All Selling Expenses relating to Registrable Securities registered pursuant to this Section 2 shall be borne and paid by the Holders *pro rata* on the basis of the number of Registrable Securities registered on their behalf.

2.9 Indemnification. If any Registrable Securities are included in a registration statement under this Section 2:

(a) To the extent permitted by law, the Company will indemnify and hold harmless each selling Holder, and the partners, members, officers, directors, and shareholders of each such Holder; legal counsel and accountants for each such Holder; any underwriter (as defined in the Securities Act) for each such Holder; and each Person, if any, who controls such Holder or underwriter within the meaning of the Securities Act or the Exchange Act, and each of their respective Affiliates, officers, trustees, directors, shareholders, employees and agents, against any Damages, and the Company will pay to each such Holder, underwriter, controlling Person, or other aforementioned Person any legal or other expenses reasonably incurred thereby in connection with investigating any matter or defending any proceeding from which Damages may result, as such expenses are incurred; provided, however, that the indemnity agreement contained in this Section 2.9(a) shall not apply to amounts paid in settlement of any such investigation or proceeding if such settlement is effected without the consent of the Company, which consent shall not be unreasonably withheld, conditioned or delayed, nor shall the Company be liable for any Damages to the extent that they arise out of or are based upon actions or omissions made in reliance upon and in conformity with written information furnished by or on behalf of any such Holder, underwriter, controlling Person, or other aforementioned Person expressly for use in connection with such registration.

(b) To the extent permitted by law, each selling Holder, severally and not jointly, will indemnify and hold harmless the Company, and each of its directors, each of its officers who has signed the registration statement, each Person (if any), who controls the Company within the meaning of the Securities Act, legal counsel and accountants for the Company, any underwriter (as defined in the Securities Act), any other Holder selling securities in such registration statement, and any controlling Person of any such underwriter or other Holder, against any Damages, in each case only to the extent that such Damages arise out of or are based upon actions or omissions made in reliance upon and in conformity with written information furnished by or on behalf of such selling Holder expressly for use in connection with such registration; and each such selling Holder will pay to the Company and each other aforementioned Person any legal or other expenses reasonably incurred thereby in connection with investigating any investigation or defending any proceeding from which Damages may result, as such expenses are incurred; provided, however, that the indemnity agreement contained in this Section 2.9(b) shall not apply to amounts paid in settlement of any such investigation or proceeding if such settlement is effected without the consent of the Holder, which consent shall not be unreasonably withheld, conditioned or delayed; and provided, further, that in no event shall any indemnity under this Section 2.9(b) exceed the proceeds from the offering (net of any Selling Expenses) received by such Holder, except in the case of fraud or willful misconduct by such Holder.

(c) Promptly after receipt by an indemnified party under this Section 2.9 of notice of the commencement of any action (including any governmental action) for which a party may be entitled to indemnification hereunder, such indemnified party will, if a claim in respect thereof is to be made against any indemnifying party under this Section 2.9, give the indemnifying party notice of the commencement thereof. The indemnifying party shall have the right to participate in such action and, to the extent the indemnifying party so desires, participate jointly with any other indemnifying party to which notice has been given, and to assume the defense thereof with counsel mutually satisfactory to the parties; provided, however, that an indemnified party (together with all other indemnified parties that may be represented without conflict by one counsel) shall have the right to retain one separate counsel, with the fees and expenses to be paid by the indemnifying party, if representation of such indemnified party by the counsel retained by the indemnifying party would be inappropriate due to actual or potential differing interests between such indemnified party and any other party represented by such counsel in such action. The failure to give notice to the indemnifying party within a reasonable time of the commencement of any such action shall relieve such indemnifying party of any liability to the indemnified party under this Section 2.9, to the extent that such failure materially prejudices the indemnifying party's ability to defend such action. The failure to give notice to the indemnifying party will not relieve it of any liability that it may have to any indemnified party otherwise than under this Section 2.9.

(d) The foregoing indemnity agreements of the Company and the selling Holders are subject to the condition that, insofar as they relate to any Damages arising from any untrue statement or alleged untrue statement of a material fact contained in, or omission or alleged omission of a material fact from, a preliminary prospectus (or necessary to make the statements therein not misleading) that has been corrected in the form of prospectus included in the registration statement at the time it becomes effective, or any amendment or supplement thereto filed with the SEC pursuant to Rule 424(b) under the Securities Act (the "**Final Prospectus**"), such indemnity agreement shall not inure to the benefit of any Person if a copy of the Final Prospectus was furnished to the indemnified party and such indemnified party failed to deliver, at or before the confirmation of the sale of the shares registered in such offering, a copy of the Final Prospectus to the Person asserting the loss, liability, claim, or damage in any case in which such delivery was required by the Securities Act.

(e) To provide for just and equitable contribution to joint liability under the Securities Act in any case in which either (i) any party otherwise entitled to indemnification hereunder makes a claim for indemnification pursuant to this Section 2.9 but it is judicially determined (by the entry of a final judgment or decree by a court of competent jurisdiction and the expiration of time to appeal or the denial of the last right of appeal) that such indemnification may not be enforced in such case, notwithstanding the fact that this Section 2.9 provides for indemnification in such case, or (ii) contribution under the Securities Act may be required on the part of any party hereto for which indemnification is provided under this Section 2.9, then, and in each such case, such parties will contribute to the aggregate losses, claims, damages, liabilities, or expenses to which they may be subject (after contribution from others) in such proportion as is appropriate to reflect the relative fault of the each of indemnifying party and the indemnified party in connection with the statements, omissions, or other actions that resulted in such loss, claim, damage, liability, or expense, as well as to reflect any other relevant equitable considerations. The relative fault of the indemnifying party and of the indemnified party shall be determined by reference to, among other things, whether the untrue or allegedly untrue statement of a material fact, or the omission or alleged omission of a material fact, relates to information supplied by the indemnifying party or by the indemnified party and the parties' relative intent, knowledge, access to information, and opportunity to correct or prevent such statement or omission; provided, however, that, in any such case, (x) no Holder will be required to contribute any amount in excess of the public offering price of all such Registrable Securities offered and sold by such Holder pursuant to such registration statement, and (y) no Person guilty of fraudulent misrepresentation (within the meaning of section 11(f) of the Securities Act) will be entitled to contribution from any Person who was not guilty of such fraudulent misrepresentation; and provided, further, that in no event shall a Holder's liability pursuant to this Section 2.9(e), when combined with the amounts paid or payable by such Holder pursuant to Section 2.9(b), exceed the proceeds from the offering (net of any Selling Expenses) received by such Holder, except in the case of willful misconduct or fraud by such Holder.

(f) Notwithstanding the foregoing, to the extent that the provisions on indemnification and contribution contained in the underwriting agreement entered into in connection with the underwritten public offering are in conflict with the foregoing provisions, the provisions in the underwriting agreement shall control.

(g) Unless otherwise superseded by an underwriting agreement entered into in connection with the underwritten public offering, the obligations of the Company and Holders under this Section 2.9 shall survive the completion of any offering of Registrable Securities in a registration under this Section 2, and otherwise shall survive the termination of this Agreement.

2.10 Reports Under Exchange Act. With a view to making available to the Holders the benefits of SEC Rule 144 and any other rule or regulation of the SEC that may at any time permit a Holder to sell securities of the Company to the public without registration or pursuant to a Shelf Registration Statement, the Company shall:

(a) make and keep public information available, as those terms are understood and defined in SEC Rule 144, at all times after the effective date of the registration statement filed by the Company for the IPO;

(b) use commercially reasonable efforts to file with the SEC in a timely manner all reports and other documents required of the Company under the Securities Act and the Exchange Act (at any time after the Company has become subject to such reporting requirements); and

(c) furnish to any Holder, so long as the Holder owns any Registrable Securities, forthwith upon request (i) a written statement by the Company that it has complied with the reporting requirements of SEC Rule 144 (at any time after ninety (90) days after the effective date of the registration statement filed by the Company for the IPO), the Securities Act, and the Exchange Act (at any time after the Company has become subject to such reporting requirements), or that it qualifies as a registrant whose securities may be resold pursuant to a Shelf Registration Statement (at any time after the Company so qualifies); (ii) a copy of the most recent annual or quarterly report of the Company and such other reports and documents so filed by the Company; and (iii) such other information as may be reasonably requested in availing any Holder of any rule or regulation of the SEC that permits the selling of any such securities without registration (at any time after the Company has become subject to the reporting requirements under the Exchange Act) or pursuant to such Shelf Registration Statement (at any time after the Company so qualifies to use such form).

2.11 Limitations on Subsequent Registration Rights. From and after the date of this Agreement, the Company shall not, without the prior written consent of the Holders of a majority of the Registrable Securities then outstanding, enter into any agreement with any holder or prospective holder of any securities of the Company that would allow such holder or prospective holder (i) to include such securities in any registration unless, under the terms of such agreement, such holder or prospective holder may include such securities in any such registration only to the extent that the inclusion of such securities will not reduce the number of the Registrable Securities of the Holders that are included or (ii) to demand registration of any securities held by such holder or prospective holder; provided, that this limitation shall not apply to any Additional Investor who becomes a party to this Agreement in accordance with Section 6.10.

2.12 "Market Stand-off" Agreement. Each Holder hereby agrees that, if requested in writing by the managing underwriter, it will not, without the prior written consent of the managing underwriter, during the 180-day period following the effective date of the registration statement relating to the IPO or during the 90-day period following the effective date of a registration statement relating to a subsequent public offering (or, in either case, such other period, not to exceed thirty-four (34) additional days, as may be requested by the Company or an underwriter to accommodate regulatory restrictions on (A) the publication or other distribution of research reports and (B) analyst recommendations and opinions contained in FINRA Rule 2711(f)(4) or NYSE Rule 472(f)(4), or any successor provisions or amendments thereto) effect any public sale or distribution of any shares of Common Stock or any securities convertible into or exercisable or exchangeable for Common Stock; provided, that such restrictions shall not apply to (i) securities acquired in the IPO or a subsequent public offering or in the secondary market following the IPO or a subsequent public offering, (ii) transfers to Affiliates but only if such Affiliates agree to be bound by the restrictions herein and (iii) in respect of any offering other than the IPO, transfers pursuant to customary 10b-5(1) plans in amounts that would permitted to be sold under SEC Rule 144 under the Securities Act inclusive of the volume limitations under SEC Rule 144. The foregoing provisions of this Section 2.12 shall not apply to the sale of any shares to an underwriter pursuant to an underwriting agreement, and shall be applicable to the Holders only if all officers, directors, and shareholders individually owning more than one percent (1%) of the Company's outstanding Common Stock are subject to the same restrictions. The underwriters in connection with the IPO are intended third-party beneficiaries of this Section 2.12 and shall have the right, power, and authority to enforce the provisions hereof as though they were a party hereto. Each Holder further agrees to execute such agreements as may be reasonably requested by the underwriters in the IPO that are consistent with this Section 2.12 or that are necessary to give further effect thereto.

2.13 Assignment of Registration Rights. The rights to cause the Company to register Registrable Securities pursuant to this Section 2 may be assigned (but only with all related obligations) by a Holder to a transferee of such Registrable Securities that (i) is an Affiliate, partner, member, limited partner, retired partner, retired member, or shareholder of a Holder; (ii) is a Holder's Immediate Family Member or trust for the benefit of an individual Holder or one or more of such Holder's Immediate Family Members; or (iii) in such transfer, acquires at least 10% of such Holder's shares of Registrable Securities; provided, however, that (x) the Company is, within a reasonable time after such transfer, furnished with written notice of the name and address of such transferee and the Registrable Securities with respect to which such registration rights are being transferred; (y) such transferee agrees in writing to be bound by and subject to the terms and conditions of this Agreement, including the provisions of Section 2.12. For the purposes of determining the number of shares of Registrable Securities held by a transferee, the holdings of a transferee (1) that is an Affiliate, limited partner, retired partner, member, retired member, or shareholder of a Holder; (2) who is a Holder's Immediate Family Member; or (3) that is a trust for the benefit of an individual Holder or such Holder's Immediate Family Member shall be aggregated together and with those of the transferring Holder; provided, further, that all transferees who would not qualify individually for assignment of registration rights shall have a single attorney-in-fact for the purpose of exercising any rights, receiving notices, or taking any action under this Section 2.

2.14 Restrictions on Transfer.

(a) The Preferred Stock and the Registrable Securities shall not be sold, pledged, or otherwise transferred, and the Company shall not recognize any such sale, pledge, or transfer, except upon the conditions specified in this Agreement, which conditions are intended to ensure compliance with the provisions of the Securities Act. A transferring Holder will cause any proposed purchaser, pledgee, or transferee of the Preferred Stock and the Registrable Securities held by such Holder to agree to take and hold such securities subject to the provisions and upon the conditions specified in this Agreement.

(b) Each certificate representing (i) the Preferred Stock, (ii) the Registrable Securities, and (iii) any other securities issued in respect of the securities referenced in clauses (i) and (ii), upon any stock split, stock dividend, recapitalization, merger, consolidation, or similar event, shall (unless otherwise permitted by the provisions of Section 2.14(c)) be stamped or otherwise imprinted with a legend in the following form:

THE SHARES REPRESENTED BY THIS CERTIFICATE HAVE BEEN ACQUIRED FOR INVESTMENT AND HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933. SUCH SHARES MAY NOT BE SOLD, PLEDGED, OR TRANSFERRED IN THE ABSENCE OF SUCH REGISTRATION OR A VALID EXEMPTION FROM THE REGISTRATION AND PROSPECTUS DELIVERY REQUIREMENTS OF SAID ACT.

THE SHARES REPRESENTED BY THIS CERTIFICATE MAY BE TRANSFERRED ONLY IN ACCORDANCE WITH THE TERMS OF AN AGREEMENT BETWEEN THE COMPANY AND THE SHAREHOLDER, A COPY OF WHICH IS ON FILE WITH THE SECRETARY OF THE COMPANY.

The Holders consent to the Company making a notation in its records and giving instructions to any transfer agent of the Restricted Securities in order to implement the restrictions on transfer set forth in this Section 2.14.

(c) The holder of each certificate representing Restricted Securities, by acceptance thereof, agrees to comply in all respects with the provisions of this Section 2. Before any proposed sale, pledge, or transfer of any Restricted Securities, unless there is in effect a registration statement under the Securities Act covering the proposed transaction, the Holder thereof shall give notice to the Company of such Holder's intention to effect such sale, pledge, or transfer. Each such notice shall describe the manner and circumstances of the proposed sale, pledge, or transfer in sufficient detail and, if reasonably requested by the Company, shall be accompanied at such Holder's expense by either (i) a written opinion of legal counsel who shall, and whose legal opinion shall, be reasonably satisfactory to the Company, addressed to the Company, to the effect that the proposed transaction may be effected without registration under the Securities Act; (ii) a "no action" letter from the SEC to the effect that the proposed sale, pledge, or transfer of such Restricted Securities without registration will not result in a recommendation by the staff of the SEC that action be taken with respect thereto; or (iii) any other evidence reasonably satisfactory to counsel to the Company to the effect that the proposed sale, pledge, or transfer of the Restricted Securities may be effected without registration under the Securities Act, whereupon the Holder of such Restricted Securities shall be entitled to sell, pledge, or transfer such Restricted Securities in accordance with the terms of the notice given by the Holder to the Company. The Company will not require such a legal opinion or "no action" letter (x) in any transaction in compliance with SEC Rule 144 or (y) in any transaction in which such Holder distributes Restricted Securities to an Affiliate of such Holder; provided that each transferee agrees in writing to be subject to the terms of this Section 2.14(c). Each certificate evidencing the Restricted Securities transferred as above provided shall bear, except if such transfer is made pursuant to SEC Rule 144, the appropriate restrictive legend set forth in Section 2.14(b), except that such certificate shall not bear such restrictive legend if, in the opinion of counsel for such Holder and the Company, such legend is not required in order to establish compliance with any provisions of the Securities Act.

2.15 Termination of Registration Rights. The right of any Holder to request registration or inclusion of Registrable Securities in any registration pursuant to Section 2.1, Section 2.2, or Section 2.3 shall terminate upon the earlier of:

(a) five (5) years after the IPO; or

(b) when such Holder is legally permitted to sell all of such Holder's Registrable Securities without registration under the Securities Act during a 90-day period or less, pursuant to SEC Rule 144, or any other applicable exemption from registration.

Notwithstanding the foregoing, the right of any Major Investor to request registration or inclusion of Registrable Securities in any registration pursuant to Section 2.1, Section 2.2, or Section 2.3 shall not terminate until such time as such Major Investor holds no Registrable Securities.

3. Information Rights.

3.1 Delivery of Financial Statements. The Company shall deliver to each Major Investor, provided, that such Major Investor is an institutional financial investor, individual, trust or entity that is not otherwise a strategic investor:

(a) as soon as practicable, but in any event within one hundred eighty (180) days after the end of each fiscal year of the Company, its audited financial statements as of the end of and for such fiscal year (including a balance sheet, income statement and statement of cash flows), all prepared in accordance with GAAP (except that such financial statements may not contain all notes thereto that may be required in accordance with GAAP);

(b) as soon as practicable, but in any event within forty-five (45) days after the end of each of the first three (3) quarters of each fiscal year of the Company its unaudited financial statements as of the end of and for such fiscal quarter (including a balance sheet, income statement and statement of cash flows), all prepared in accordance with GAAP (except that the financial report may (i) be subject to normal year-end audit adjustments and (ii) not contain all notes thereto that may be required in accordance with GAAP);

If, for any period, the Company has any subsidiary whose accounts are consolidated with those of the Company, then in respect of such period the financial statements delivered pursuant to the foregoing sections shall be the consolidated and consolidating financial statements of the Company and all such consolidated subsidiaries.

3.2 Inspection. The Company shall permit each Major Investor, at such Major Investor's expense, to visit and inspect the properties of the Company, including its corporate and financial records, and to discuss its business and finances with officers of the Company during normal business hours upon reasonable advance notice; provided, however, that the Company shall not be obligated pursuant to this Section 3.2 to provide access to any information that it reasonably considers to be a trade secret or confidential information (unless covered by an enforceable confidentiality agreement, in form acceptable to the Company) or the disclosure of which would adversely affect the attorney-client privilege between the Company and its counsel.

3.3 Termination of Information Rights. The covenants set forth in Section 3.1 shall terminate and be of no further force or effect (i) immediately before the consummation of the IPO, (ii) when the Company first becomes subject to the periodic reporting requirements of section 12(g) or 15(d) of the Exchange Act, or (iii) upon a Corporate Event (as defined in the Amended Articles), whichever event occurs first. The covenants set forth in Section 3.2 shall terminate and be of no further force or effect upon a Corporate Event.

3.4 Confidentiality. Each Investor agrees that such Investor will keep confidential and will not disclose, divulge, or use for any purpose (other than to monitor its investment in the Company) any confidential information obtained from the Company pursuant to the terms of this Agreement (including notice of the Company's intention to file a registration statement), unless such confidential information (a) is known or becomes known to the public in general (other than as a result of a breach of this Section 3.4 by such Investor), (b) is or has been independently developed or conceived by the Investor without use of the Company's confidential information, or (c) is or has been made known or disclosed to the Investor by a third party without a breach of any obligation of confidentiality such third party may have to the Company; provided, however, that an Investor may disclose confidential information (i) to its attorneys, accountants, consultants, and other professionals to the extent necessary to obtain their services in connection with monitoring its investment in the Company; (ii) to any prospective purchaser of any Registrable Securities from such Investor, if the Board of Directors reasonably determines in advance of such disclosure that such prospective purchaser is not a competitor of the Company and such prospective purchaser agrees to be bound by the provisions of this Section 3.4; (iii) to any Affiliate, partner, member, shareholder, wholly owned subsidiary, or potential partner, member or shareholder of such Investor in the ordinary course of business, provided that such Investor informs such Person that such information is confidential and directs such Person to maintain the confidentiality of such information, and provided further that such Person is not a competitor of the Company, as determined by the Board of Directors; or (iv) as may otherwise be required by law, provided that the Investor promptly notifies the Company of such disclosure and takes reasonable steps to minimize the extent of any such required disclosure.

4. Rights to Future Stock Issuances

4.1 Right of First Offer. Subject to the terms and conditions of this Subsection 4.1 and applicable securities laws, if the Company proposes to offer or sell any New Securities, the Company shall first offer such New Securities to each Major Investor. A Major Investor shall be entitled to apportion the right of first offer hereby granted to it in such proportions as it deems appropriate, among (i) itself and (ii) its Affiliates; provided that each such Affiliate (x) is not a competitor of the Company, as reasonably determined by the Board of Directors, unless such party's purchase of New Securities is otherwise consented to by the Board of Directors, and (y) agrees to enter into this Agreement and the Sixth Amended and Restated Voting Agreement dated as of December 11, 2017 among the Company, the Investors and the other parties named therein, as an "Investor" under each such agreement.

(a) The Company shall give notice (the "**Offer Notice**") to each Major Investor, stating (i) its bona fide intention to offer such New Securities, (ii) the number of such New Securities to be offered, and (iii) the price and terms, if any, upon which it proposes to offer such New Securities.

(b) By notification to the Company within twenty (20) days after the Offer Notice is given, each Major Investor may elect to purchase or otherwise acquire, at the price and on the terms specified in the Offer Notice, up to that portion of such New Securities which equals the proportion that the Common Stock then held by such Major Investor (including all shares of Common Stock then issuable upon conversion of the Preferred Stock then held by such Major Investor) bears to the total Common Stock of the Company then outstanding (assuming full conversion and/or exercise, as applicable, of all Preferred Stock and other Derivative Securities) (with respect to each Major Investor, such Major Investor's "**Pro Rata Portion**"); provided, however, that the portion of New Securities offered to the Major Investors pursuant to this Section 4 may be reduced by up to fifty percent (50%) of each Major Investor's Pro Rata Portion if the Board of Directors (x) unanimously determines in good faith that such a reduction is necessary to attract strategically required investment in the Company and (y) notifies the Major Investors of such determination and each Major Investors' cut-back portion of the New Securities in the Offer Notice. At the expiration of such twenty (20) day period, the Company shall promptly notify each Major Investor that elects to purchase or acquire all the shares available to it (each, a "**Fully Exercising Investor**") of any other Major Investor's failure to do likewise. During the ten (10) day period commencing after the Company has given such notice, each Fully Exercising Investor may, by giving notice to the Company, elect to purchase or acquire, in addition to the number of shares specified above, up to that portion of the New Securities for which Major Investors were entitled to subscribe but that were not subscribed for by the Major Investors which is equal to the proportion that the number of shares of Common Stock issuable upon conversion of the Preferred Stock then held by such Fully Exercising Investor bears to the total number of shares of Common Stock then issuable upon conversion of the Preferred Stock then held by all Fully Exercising Investors who wish to purchase such unsubscribed shares. The closing of any sale pursuant to this Subsection 4.1(b) shall occur within the later of ninety (90) days of the date that the Offer Notice is given and the date of initial sale of New Securities pursuant to Subsection 4.1(c).

(c) If all New Securities referred to in the Offer Notice are not elected to be purchased or acquired as provided in Subsection 4.1(b), the Company may, during the ninety (90) day period following the expiration of the periods provided in Subsection 4.1(b), offer and sell the remaining unsubscribed portion of such New Securities to any Person or Persons at a price not less than, and upon terms no more favorable to the offeree than, those specified in the Offer Notice. If the Company does not enter into an agreement for the sale of the New Securities within such period, or if such agreement is not consummated within thirty (30) days of the execution thereof, the right provided hereunder shall be deemed to be revived and such New Securities shall not be offered unless first reoffered to the Major Investors in accordance with this Subsection 4.1.

(d) The right of first offer in this Subsection 4.1 shall not be applicable to (i) Exempted Securities (as defined in the Amended Articles); and (ii) shares of Common Stock issued in the IPO.

4.2 Termination. The covenants set forth in Subsection 4.1 shall terminate and be of no further force or effect (i) immediately before the consummation of the QPO (as defined in the Amended Articles) or (ii) upon a Corporate Event (as defined in the Amended Articles), whichever event occurs first.

5. Right of Co-Sale.

5.1 Definitions. For purposes of this Section 5:

(a) "**Proposed Key Holder Transfer**" means any assignment, sale, offer to sell, pledge, mortgage, hypothecation, encumbrance, disposition of or any other like transfer or encumbering of any Transfer Stock (or any interest therein) proposed by any of the Key Holders.

(b) "**Proposed Transfer Notice**" means written notice from a Key Holder setting forth the terms and conditions of a Proposed Key Holder Transfer.

(c) "**Prospective Transferee**" means any person to whom a Key Holder proposes to make a Proposed Key Holder Transfer.

(d) "**Right of Co-Sale**" means the right, but not an obligation, of an Investor to participate in a Proposed Key Holder Transfer on the terms and conditions specified in the Proposed Transfer Notice.

(e) "**Transfer Stock**" means shares of Common Stock or Preferred Stock owned by a Key Holder, or issued to a Key Holder after the date hereof (including, without limitation, in connection with any stock split, stock dividend, recapitalization, reorganization, or the like).

5.2 Right of Co-Sale.

(a) Grant. Subject to the terms of Sections 5.4 and 5.5 below, each Key Holder hereby unconditionally and irrevocably grants to each Major Investor a Right of Co-Sale to participate on a pro rata basis in any Proposed Key Holder Transfer.

(b) Notice. Each Key Holder proposing to make a Proposed Key Holder Transfer must deliver a Proposed Transfer Notice to the Company and each Major Investor not later than thirty (30) days prior to the consummation of such Proposed Key Holder Transfer. Such Proposed Transfer Notice shall contain the material terms and conditions (including price and form of consideration) of the Proposed Key Holder Transfer, the identity of the Prospective Transferee and the intended date of the Proposed Key Holder Transfer.

(c) Exercise of Right. Each Major Investor may elect to exercise its Right of Co-Sale and participate on a pro rata basis in the Proposed Key Holder Transfer as set forth in Subsection 2.2(d) below and, subject to Subsection 2.2(e), otherwise on the same terms and conditions specified in the Proposed Transfer Notice. Each Major Investor who desires to exercise its Right of Co-Sale (each, a "**Participating Major Investor**") must give the selling Key Holder written notice to that effect within fifteen (15) days after the deadline for delivery of the Proposed Transfer Notice described above, and upon giving such notice such Participating Major Investor shall be deemed to have effectively exercised the Right of Co-Sale.

(d) Shares Includable. Each Participating Major Investor may include in the Proposed Key Holder Transfer all or any part of such Participating Major Investor's shares of Common Stock issued or issuable upon conversion of Preferred Stock equal to the product obtained by multiplying (i) the aggregate number of shares of Common Stock issued or issuable upon conversion of Transfer Stock subject to the Proposed Key Holder Transfer by (ii) a fraction, the numerator of which is the number of shares of Common Stock issued or issuable upon conversion of Preferred Stock then owned by such Participating Major Investor immediately before consummation of the Proposed Key Holder and the denominator of which is the total number of shares of Common Stock issued or issuable upon conversion of Preferred Stock then owned, in the aggregate, by all Participating Major Investors immediately prior to the consummation of the Proposed Key Holder Transfer, plus the number of shares of Common Stock issued or issuable upon conversion of Transfer Stock held by the Key Holders. To the extent one (1) or more of the Participating Major Investors exercise such right of participation in accordance with the terms and conditions set forth herein, the number of shares of Transfer Stock that the selling Key Holder may sell in the Proposed Key Holder Transfer shall be correspondingly reduced.

(e) Purchase and Sale Agreement. The Participating Major Investors and the selling Key Holder agree that the terms and conditions of any Proposed Key Holder Transfer in accordance with Subsection 5.2 will be memorialized in, and governed by, a written purchase and sale agreement with the Prospective Transferee (the "**Purchase and Sale Agreement**") with customary terms and provisions for such a transaction, and the Participating Major Investors and the selling Key Holder further covenant and agree to enter into such Purchase and Sale Agreement as a condition precedent to any sale or other transfer in accordance with this Subsection 5.2; provided, that (1) any liability under such Purchase and Sale Agreement shall be several, and not joint, and (2) no Participating Major Investor shall be required to enter into an "non-competition" or similar restriction in connection with any such Purchase and Sale Agreement.

(f) Allocation of Consideration. The aggregate consideration payable to the Participating Major Investors and the selling Key Holder shall be allocated based on the number of shares of Common Stock sold to the Prospective Transferee by each Participating Major Investor and the selling Key Holder as provided in Subsection 5.2(d), provided that if a Major Investor or Participating Major Investor wishes to sell Preferred Stock, the price set forth in the Proposed Transfer Notice shall be appropriately adjusted based on the conversion ratio of the Preferred Stock into Common Stock.

(g) Purchase by Selling Key Holder; Deliveries. Notwithstanding Subsection 5.2(e) above, if any Prospective Transferee refuse(s) to purchase securities subject to the Right of Co-Sale from any Participating Major Investor or upon the failure to negotiate in good faith a Purchase and Sale Agreement reasonably satisfactory to the Participating Major Investors, no Key Holder may sell any Transfer Stock to such Prospective Transferee unless and until, simultaneously with such sale, such Key Holder purchases all securities subject to the Right of Co-Sale from such Participating Major Investor on the same terms and conditions (including the proposed purchase price) as set forth in the Proposed Transfer Notice and as provided in Subsection 5.2(f). In connection with such purchase by the selling Key Holder, such Participating Major Investor shall deliver to the selling Key Holder a stock certificate or certificates, properly endorsed for transfer, representing the Common Stock being purchased by the selling Key Holder. Each such stock certificate delivered to the selling Key Holder will be transferred to the Prospective Transferee against payment therefor in consummation of the sale of the Transfer Stock pursuant to the terms and conditions specified in the Proposed Transfer Notice, and the selling Key Holder shall concurrently therewith remit or direct payment to each such Participating Major Investor the portion of the aggregate consideration to which each such Participating Major Investor is entitled by reason of its participation in such sale as provided in this Subsection 5.2(g).

(h) Additional Compliance. If any Proposed Key Holder Transfer is not consummated within forty-five (45) days after receipt of the Proposed Transfer Notice by the Company, the Key Holders proposing the Proposed Key Holder Transfer may not sell any Transfer Stock unless they first comply in full with each provision of this Section 5. The exercise or election not to exercise any right by any Major Investor hereunder shall not adversely affect its right to participate in any other sales of Transfer Stock subject to this Subsection 5.2.

5.3 Effect of Failure to Comply.

(a) Transfer Void; Equitable Relief. Any Proposed Key Holder Transfer not made in compliance with the requirements of this Agreement shall be null and void *ab initio*, shall not be recorded on the books of the Company or its transfer agent and shall not be recognized by the Company. Each party hereto acknowledges and agrees that any breach of this Agreement would result in substantial harm to the other parties hereto for which monetary damages alone could not adequately compensate. Therefore, the parties hereto unconditionally and irrevocably agree that any non-breaching party hereto shall be entitled to seek protective orders, injunctive relief and other remedies available at law or in equity (including, without limitation, seeking specific performance or the rescission of purchases, sales and other transfers of Transfer Stock not made in strict compliance with this Agreement).

(b) Violation of Co-Sale Right. If any Key Holder purports to sell any Transfer Stock in contravention of the Right of Co-Sale (a "**Prohibited Transfer**"), each Major Investor who desires to exercise its Right of Co-Sale under Subsection 5.2 may, in addition to such remedies as may be available by law, in equity or hereunder, require such Key Holder to purchase from such Major Investor the type and number of shares of Common Stock that such Major Investor would have been entitled to sell to the Prospective Transferee had the Prohibited Transfer been effected in compliance with the terms of Subsection 5.2. The sale will be made on the same terms, including, without limitation, as provided in Subsection 5.2(f), and subject to the same conditions as would have applied had the Key Holder not made the Prohibited Transfer, except that the sale (including, without limitation, the delivery of the purchase price) must be made within ninety (90) days after the Major Investor learns of the Prohibited Transfer, as opposed to the timeframe proscribed in Subsection 5.2. Such Key Holder shall also reimburse each Major Investor for any and all reasonable and documented out-of-pocket fees and expenses, including reasonable legal fees and expenses, incurred pursuant to the exercise or the attempted exercise of the Major Investor's rights under Subsection 5.2.

5.4 Exempted Transfers. Notwithstanding the foregoing or anything to the contrary herein, the provisions of Subsection 5.2 shall not apply: (a) to a pledge of Transfer Stock that creates a mere security interest in the pledged Transfer Stock, provided that the pledgee thereof agrees in writing in advance to be bound by and comply with all applicable provisions of this Agreement to the same extent as if it were the Key Holder making such pledge; or (b) upon a transfer of Transfer Stock by such Key Holder made for bona fide estate planning purposes, either during his or her lifetime or on death by will or intestacy to his or her spouse, child (natural or adopted), sibling, parent or any other direct lineal descendant of such Key Holder (or his or her spouse) (all of the foregoing collectively referred to as "family members"), or any custodian or trustee of any trust, partnership or limited liability company for the benefit of, or the ownership interests of which are owned wholly by such Key Holder or any such family members; provided that in the case of clause(s) (a) or (b), the Key Holder shall deliver prior written notice to the Major Investors of such pledge, gift or transfer and such shares of Transfer Stock shall at all times remain subject to the terms and restrictions set forth in this Agreement and such transferee shall, as a condition to such issuance, deliver a counterpart signature page to this Agreement as confirmation that such transferee shall be bound by all the terms and conditions of this Agreement as a Key Holder (but only with respect to the securities so transferred to the transferee), including the obligations of a Key Holder with respect to Proposed Key Holder Transfers of such Transfer Stock pursuant to Subsection 5.2.

5.5 Exempted Offerings; Termination. Notwithstanding the foregoing or anything to the contrary herein, the provisions of Section 5 shall not apply to the sale of any Transfer Stock in, and shall terminate and be of no further force or effect immediately prior to (a) the QPO; or (b) a Corporate Event.

5.6 Legend. Each certificate representing shares of Transfer Stock held by the Key Holders or issued to any permitted transferee in connection with a transfer permitted by Subsection 5.4 hereof shall be endorsed with the following legend:

> THE SALE, PLEDGE, HYPOTHECATION, OR TRANSFER OF THE SECURITIES REPRESENTED BY THIS CERTIFICATE IS SUBJECT TO, AND IN CERTAIN CASES PROHIBITED BY, THE TERMS AND CONDITIONS OF CERTAIN CO-SALE RIGHTS BY AND BETWEEN THE STOCKHOLDER AND CERTAIN OTHER HOLDERS OF STOCK OF THE CORPORATION. COPIES OF THE AGREEMENT CONTAINING SUCH RIGHTS MAY BE OBTAINED UPON WRITTEN REQUEST TO THE SECRETARY OF THE CORPORATION.

Each Key Holder agrees that the Company may instruct its transfer agent to impose transfer restrictions on the shares represented by certificates bearing the legend referred to in this Section 5.6 above to enforce the provisions of this Agreement, and the Company agrees to promptly do so. The legend shall be removed upon termination of this Agreement at the request of the holder.

6. Key Holder Non-Competition and Non-Solicitation. Each Key Holder hereby covenants and agrees with the Company that, until the later of (x) April 3, 2017 and (y) eighteen (18) months after termination of such Key Holder's employment with or other services to the Company, such Key Holder will not: (a) directly or indirectly, whether as an owner, director, officer, manager, consultant, agent or employee, accept employment or engage in activities that directly compete with the business of the Company or with the reasonably anticipated planned product developments of Company as of the date of such Key Holder's termination of services to the Company; or (b) solicit, encourage, or cause others to solicit or encourage any employees, customers, clients or suppliers of Company to terminate their employment or customer, client or supplier relationship, as applicable, with the Company. Each Key Holder acknowledges that due to the nature of the Company's business, there is no restriction on the geographical scope of such Key Holder's non-competition obligations to Company. Each Key Holder further acknowledges that the Company competes on a worldwide basis and that the geographical scope of these limitations is reasonable and necessary for the protection of Company's trade secrets and other proprietary information. Each Key Holder further acknowledges that if a court of competent jurisdiction finds this non-competition provision invalid or unenforceable due to unreasonableness in time, geographic scope, or scope, then such court will interpret and enforce this provision to the maximum extent that such court deems reasonable. The covenants set forth in this Section 6 shall terminate and be of no further force or effect immediately before the consummation of the QPO.

7. Miscellaneous.

7.1 Successors and Assigns. Each Investor hereby agrees that it shall not, and may not, assign any of its rights and obligations hereunder, unless such rights and obligations are assigned by such Investor to any Person to which Registrable Securities are transferred by such Investor pursuant to Section 2.13, and such assignee shall be deemed an "Investor" for purposes of this Agreement; provided that such assignment of rights shall be contingent upon the assignee providing a written instrument to the Company notifying the Company of such assignment and agreeing in writing to be bound by the terms of this Agreement. The terms and conditions of this Agreement inure to the benefit of and are binding upon the respective successors and permitted assignees of the parties. Nothing in this Agreement, express or implied, is intended to confer upon any party other than the parties hereto or their respective successors and permitted assignees any rights, remedies, obligations or liabilities under or by reason of this Agreement, except as expressly provided herein.

7.2 Governing Law. This Agreement shall be governed by and construed in accordance with the internal laws of the State of Washington, without regard to its principles of conflicts of laws.

7.3 Counterparts. This Agreement may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. This Agreement may also be executed and delivered by facsimile signature and in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

7.4 Titles and Subtitles. The titles and subtitles used in this Agreement are for convenience only and are not to be considered in construing or interpreting this Agreement.

7.5 Notices. All notices, requests, and other communications given or made pursuant to this Agreement shall be in writing and shall be deemed effectively given (i) upon personal delivery to the party to be notified; (ii) when sent by confirmed electronic mail or facsimile if sent during normal business hours of the recipient, and if not so confirmed, then on the next business day; (iii) five (5) days after having been sent by registered or certified mail, return receipt requested, postage prepaid; or (iv) one (1) day after deposit with a nationally recognized overnight courier, specifying next-day delivery, with written verification of receipt. All communications shall be sent to the respective parties at their addresses on file with the Company, or to such email address, facsimile number, or address as subsequently modified by written notice given in accordance with this Section 7.5. If notice is given to the Company, which notice shall be sent to the attention of the Company's General Counsel, and a copy shall also be sent to DLA Piper LLP (US), 701 Fifth Avenue, Suite 6900, Seattle, WA 98104, Attn: Tyler Hollenbeck.

7.6 Amendments and Waivers. Any term of this Agreement may be amended and the observance of any term of this Agreement may be waived (either generally or in a particular instance, and either retroactively or prospectively) only with the written consent of the Company and the holders of a majority of the Registrable Securities then outstanding; provided that the Company may in its sole discretion waive compliance with Section 2.14(c). Notwithstanding the foregoing:

(a) this Agreement may not be amended or terminated and the observance of any term hereof may not be waived with respect to any Investor without the written consent of such Investor, unless such amendment, termination, or waiver applies to all Investors in the same fashion;

(b) The definition of "Major Investor", this Section 7.6(b) and the rights of Major Investors under Sections 3, 4 and 5 may not be amended, waived or terminated without the written consent of the Major Investors holding a majority of the Preferred Stock then outstanding, including a majority of the Series E-1 Preferred Stock then outstanding;

(c) any holder of Preferred Stock may become a party to this Agreement by signing a counterpart signature or joinder without the written consent of any Investor or Key Holder, and Schedule A shall be updated to reflect such additional party to this Agreement; and

(d) Sections 5 and 6 may not be amended or terminated without the written consent of the Key Holders.

Any amendment, termination, or waiver effected in accordance with this Section 7.6 shall be binding on all parties hereto, regardless of whether any such party has consented thereto. No waivers of or exceptions to any term, condition, or provision of this Agreement, in any one or more instances, shall be deemed to be or construed as a further or continuing waiver of any such term, condition, or provision.

7.7 Severability. In case any one or more of the provisions contained in this Agreement is for any reason held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provision of this Agreement, and such invalid, illegal, or unenforceable provision shall be reformed and construed so that it will be valid, legal, and enforceable to the maximum extent permitted by law.

7.8 Aggregation of Stock. All shares of Registrable Securities held or acquired by Affiliates shall be aggregated together for the purpose of determining the availability of any rights under this Agreement.

7.9 Prior Agreement; Entire Agreement. The Prior IRA is hereby amended and restated in its entirety by this Agreement, and as of the date hereof the Prior IRA shall be deemed superseded hereby. This Agreement (including any Schedules hereto) constitutes the full and entire understanding and agreement between the parties with respect to the subject matter hereof, and any other written or oral agreement relating to the subject matter hereof existing between the parties is expressly canceled.

7.10 Dispute Resolution. The parties (a) hereby irrevocably and unconditionally submit to the jurisdiction of the state courts of the State of Washington and to the jurisdiction of the United States District Court for the Western District of Washington for the purpose of any suit, action or other proceeding arising out of or based upon this Agreement, (b) agree not to commence any suit, action or other proceeding arising out of or based upon this Agreement except in the state courts of the State of Washington or the United States District Court for the Western District of Washington, and (c) hereby waive, and agree not to assert, by way of motion, as a defense, or otherwise, in any such suit, action or proceeding, any claim that it is not subject personally to the jurisdiction of the above-named courts, that its property is exempt or immune from attachment or execution, that the suit, action or proceeding is brought in an inconvenient forum, that the venue of the suit, action or proceeding is improper or that this Agreement or the subject matter hereof may not be enforced in or by such court. Each party hereby waives, to the fullest extent permitted by applicable law, any right it may have to a trial by jury in respect of any suit, action or other proceeding arising out of or based upon this Agreement.

7.11 Delays or Omissions. No delay or omission to exercise any right, power, or remedy accruing to any party under this Agreement, upon any breach or default of any other party under this Agreement, shall impair any such right, power, or remedy of such nonbreaching or nondefaulting party, nor shall it be construed to be a waiver of or acquiescence to any such breach or default, or to any similar breach or default thereafter occurring, nor shall any waiver of any single breach or default be deemed a waiver of any other breach or default theretofore or thereafter occurring. All remedies, whether under this Agreement or by law or otherwise afforded to any party, shall be cumulative and not alternative.

[*Signature Pages Follow*.]

IN WITNESS WHEREOF, the parties have executed this Seventh Amended and Restated Investors' Rights Agreement as of the date first written above.

COMPANY:
Adaptive Biotechnologies Corporation

By: /s/ Chad M. Robins
Chad M. Robins
President

[SIGNATURE PAGE TO ADAPTIVE BIOTECHNOLOGIES CORPORATION
SEVENTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT]

IN WITNESS WHEREOF, the parties have executed this Seventh Amended and Restated Investors' Rights Agreement as of the date first written above.

KEY HOLDERS:

/s/ Chad M. Robins
Chad M. Robins

South Dakota Trust Company, Trustee of the Harlan Robins 2017 Trust U/T/A dated December 14, 2017

By: /s/ Frances R. Becker
Name: Frances R. Becker
Title: Directed Trustee

HSR 2014 Father's Trust U/T/A dated June 17, 2014

By: /s/ Karen E. Robins
Name: Karen E. Robins
Title: Trustee

HSR 2014 Mother's Trust U/T/A dated June 17, 2014

By: /s/ Karen E. Robins
Name: Karen E. Robins
Title: Co-trustee

By: /s/ Chad Robins
Name: Chad Robins
Title: Co-trustee

HSR 2017 Trust for Descendants, U/A/D November 10, 2017

By: /s/ Chad Robins
Name: Chad Robins
Title: Trustee

IN WITNESS WHEREOF, the parties have executed this Seventh Amended and Restated Investors' Rights Agreement as of the date first written above.

KEY HOLDERS:

/s/ Harlan S. Robins
Harlan S. Robins

CMR 2014 Father's Trust U/T/A dated July 2, 2014

By: /s/ Karen E. Robins
Name: Karen E. Robins
Title: Trustee

CMR 2014 Mother's Trust U/T/A dated July 2, 2014

By: /s/ Karen E. Robins
Name: Karen E. Robins
Title: Co-trustee

By: /s/ Harlan Robins
Name: Harlan Robins
Title: Co-trustee

CMR 2014 Brother's Trust U/T/A dated July 2, 2014

By: /s/ Karen E. Robins
Name: Karen E. Robins
Title: Co-trustee

By: /s/ Harlan Robins
Name: Harlan Robins
Title: Co-trustee

CMR 2018 BRR Trust, u/a/d October 3, 2018

By: /s/ Karen E. Robins
Name: Karen E. Robins
Title: Trustee

CMR 2018 SRR Trust, u/a/d October 3, 2018

By: /s/ Karen E. Robins
Name: Karen E. Robins
Title: Trustee

IN WITNESS WHEREOF, the parties have executed this Seventh Amended and Restated Investors' Rights Agreement as of the date first written above.

KEY HOLDER:

VIKING GLOBAL OPPORTUNITIES ILLIQUID INVESTMENTS SUB-MASTER LP
By: Viking Global Opportunities Portfolio GP LLC
Its: Investment Manager

By: /s/ Matthew Bloom
Name: Matthew Bloom
Title: Authorized Signatory

INVESTORS:

VIKING GLOBAL EQUITIES II LP
By: Viking Global Performance LLC
Its: General Partner

By: /s/ Matthew Bloom
Name: Matthew Bloom
Title: Authorized Signatory

VIKING GLOBAL EQUITIES MASTER LTD.
By: Viking Global Performance LLC
Its: General Partner

By: /s/ Matthew Bloom
Name: Matthew Bloom
Title: Authorized Signatory

VIKING LONG FUND MASTER LTD.
By: Viking Long Fund GP LLC
Its: Investment Manager

By: /s/ Matthew Bloom
Name: Matthew Bloom
Title: Authorized Signatory

IN WITNESS WHEREOF, the parties have executed this Seventh Amended and Restated Investors' Rights Agreement as of the date first written above.

INVESTORS:

MATRIX CAPITAL MANAGEMENT MASTER FUND, LP

By: /s/ David E. Goel
Name: David E. Goel
Title: Managing General Partner

IN WITNESS WHEREOF, the parties have executed this Seventh Amended and Restated Investors' Rights Agreement as of the date first written above.

INVESTORS:

SWEETWATER SECONDARIES FUND II L.P.

By: Sweetwater Secondaries Fund II GP LLC
Its: General Partner

By: /s/ Brent Granado
Name: Brent Granado
Title: Managing Partner

SWEETWATER REVELATION, LLC

By: /s/ Brent Granado
Name: Brent Granado
Title: Managing Partner

SW SECONDARIES II A LLC

By: /s/ Brent Granado
Name: Brent Granado
Title: Managing Partner

SW SECONDARIES II B LLC

By: /s/ Brent Granado
Name: Brent Granado
Title: Managing Partner

IN WITNESS WHEREOF, the parties have executed this Seventh Amended and Restated Investors' Rights Agreement as of the date first written above.

INVESTOR (if individual):

_____

Signature

_____

Name (type or print)

_____

Signature of Co-Signer (if any)

_____

Name of Co-Signer (type or print)

Address: _____

_____

_____

INVESTOR (if entity or trust):

_____

Name of Entity or Trust

By: _____

Name: _____

Its: _____

[SIGNATURE PAGE TO ADAPTIVE BIOTECHNOLOGIES CORPORATION
SEVENTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT]

SCHEDULE A – INVESTORS

Shareholder
667, L.P.
Adam Garber Roth IRA
Akita Investments, LLC
Alexandria Equities, LLC
Allen, Charles S.
Allen, Charles S. Jr.
Allen, Graham C.
Allen, James
Anderson, James E.
Asbury, Thomas
Baker Brothers Life Sciences, L.P.
Baker, Eric H.
Ballenger, John R., M.D. PSP
Barbara A. Clark Revocable Trust dated November 14, 2002
Barton, Douglas
Beck Family Trust U/A/D 08/14/98
Beck, Charles A., Jr, M.D.
Becton, Dickenson and Company
Beebe, Mark
Bezwada, Hari P.
Bocceri, Frederic R. and Bonita M. Bahre
Brennan, Sean P.
Brighton, Charles
Brunhofer, Brian
Bushell, Douglas and Stephanie
Candida Abrahamson Revocable Trust, Dated Oct. 12, 2015
Carlson Family Trust
Carlton, Abigail and Scott Stucky
Carlton, Charles and Caroline
Casdin Partners Master Fund LP
Celgene Corporation
Chapin, Sam
Chatalas, Bret
Chatalas, Marc
Chatalas, William B.
Christian, Matt
Chu, Stanley
Clothier, Kirk A.
CMR 2014 Brother’s Trust U/T/A dated July 2, 2014
CMR 2014 Father’s Trust U/T/A dated July 2, 2014
CMR 2014 Mother’s Trust U/T/A dated July 2, 2014
Constantino, Matthew
Crile, Chet
Cummings, Craig
Daniel, Steven
David W. Miller and Sheila F. Miller Joint Tenants with Rights of Survivorship
Decheng Capital China Life Sciences USD Fund I, L.P.

SCHEDULE A – INVESTORS

Shareholder
Declaration of Trust of Renee M. Schoenberg dated 2/24/81, as amended
Dee, Sutee
DeMaio, Craig
Demashkeih, Rasha
Diamond, Betty
Diane Cress Cabelof Trust
Dogra, Devinder
Dondero, John and Carey
Dondero, Kristopher
Duea, Brad and Cristi
Dyson, Patricia Heakin
East Elkhorn Valley, LLC
Eiting, Elizabeth
Epstein, Robert
Equitus Capital LLC
Equity Trust Company FBO Elizabeth P Holmes
Equity Trust Company, d.b.a. Sterling Trust Custodian FBO William P. Holmes SEP IRA
EquityZen Growth Technology Fund LLC – Series 346
EquityZen Growth Technology Fund LLC – Series 368
Eskenazi, Michael
Fang, Lei
Farzad Nazem & Noosheen Hashemi Living Trust Dated 7/10/95
Fidelity Management Trust Co. Custodian for G. Edward Means Roth IRA
Forbes-Eisner Family Trust, UTD Nov. 26, 2001
Frank Dominguez, Jr. Grantor Retained Annuity Trust
Frank Dominguez, Jr. Revocable Trust
Fraser, Katherine E.
Frederic R. Bocceri Profit Sharing Plan
Garber, Adam
Garber, Elise
Garber, Joel
Garber, Loren
Ghafghaichi, Majid
Gildor, Ephraim
Gingrich, Robert
Glascott, Timothy
Gorman, Alvin
Gottesman, Daniel
Greatrex, Peter
Guarantee & Trust Co TTEE FBO Allen J. Ginsburg IRA
Haddock, Stephen M.
Halperin, Errol R.
Hardenbol, Paul
Hare & Co., LLC
Hazeltime LLC
Helms, David B.

SCHEDULE A – INVESTORS

Shareholder
Helmy A. Eltoukhy Helmy A. Eltoukhy Revocable Trust
Hernandez, Luis
Hielscher, Richard
Higgins, Frank M.
Holmstrom, John and Barbara, JTROS
HSR 2014 Father's Trust U/T/A dated June 17, 2014
HSR 2014 Mother's Trust U/T/A dated June 17, 2014
HSR 2017 Trust For Descendants, U/A/D November 10, 2017
Htun, Sai
Illumina, Inc.
J. Rieger Ltd.
Jacobs, Jeffrey H.
Jain, Maneesh
Jason Krasno Family Trust dated December 7, 2015
Johnson, Jeffrey A.
Judith A. Ginsburg Trust dated October 4, 2017
JWP Properties, LLC
Kahn, Matthew and Nichole
Karen E. Robins, Trustee of the CMR 2018 SRR Trust, u/a/d October 3, 2018
Karen E. Robins, Trustee of the CMR 2018 BRR Trust, u/a/d October 3, 2018
Karen E. Robins, Trustee of the Lawrence A Robins GST Marital Trust, u/a/d September 12, 2016
Karlin-Neumann, George
Katz, Ronald C.
Keane, Peter
Keehnel, Stellman
Keim Family Trust u/a/d August 11, 2016
Kelly E. Fitz DYN Trust
Kemp, Richard Hans
Kessler, Irvin
Kingfisher Capital LLC
Kirk, Karen
Klinger, Mark
Koplin, Alfred N.
Krasno, Jason
Laboratory Corporation of America Holdings
Laura Gorman Trust
Lawrence A. Robins and David Sanders, Trustees of the Elysian 2012 Trust
Leffel, Brent
Leon and Rhona Schechter Revocable Trust U/A/D 01/08/97
Lora K. Eichner Grantor Retained Annuity Trust
Lora K. Eichner Revocable Trust
Louise K. Stumph Joint Tenants with Rights of Survivorship
Lubert, Jonathan
Luebeck, Georg
Maas, Catherine W.
Magnussen, J. Michael

SCHEDULE A – INVESTORS

Shareholder
Marnee V. Wirth 2000 Trust
Matrix Capital Management Master Fund, LP
Mayer, Steven and Jean
McQuaid, Howard
McQuaid, Michael E.
McQuaid, Suzanne
McQueen, Carrie
Mezistrano, Hoda
Millenium Trust Co. LLC Cust FBO Karen E. Robins Traditional IRA
Millenium Trust Co. LLC Custodian FBO Lee I. Miller Traditional IRA XXXX5C731
Mindy Schechter, Trustee of the Mindy Schechter Living Trust
Moe, Christopher S.
Naimi, Farzad
Namsaraev, Eugeni
Nathan J. Howard DYN Trust
National Financial Services, LLC CUST FBO G. Edward Means Roth IRA
National Financial Services, LLC CUST FBO Mark E. Means
National Financial Services, LLC CUST FBO Stephani I. Means Guthrie
Nelsen, Robert
Nicholas, Frank C., III
Nolan, Brett
Parker, H. Stewart
Patel, Mitaben
Pedersen, Brandon S.
Peller, Carl
Peller, Sherry
PENSCO Trust Company LLC Custodian FBO Brent Leffel IRA
Pensco Trust Company LLC Custodian FBO Craig R. DeMaio IRA
Port, Jesse
Pothuraju, Kaliprasad
Pure, Bradley N.
Pure, Jonathan A.
Raymond James & Assoc CSDN FBO James Califf III DVM IRA U/A/D 8/12/14 A/C 41406479
RBC Capital Markets, LLC Cust FBO Candace Joy SEP IRA
RBC Capital Markets, LLC Cust FBO Erik R. Boe IRA
Rekant, Mark S.
Revocable Living Trust of Richard Edward Meese
Rinella, Barbara
RLR Family Partners
RM Family Dynasty Trust
Robins, Chad M.
Robins, Harlan S.
Rock Springs Capital Master Fund LP
Rosen, Joshua
Rosen, Mark T.

SCHEDULE A – INVESTORS

Shareholder
Rowe, Sarah
Rowley, James P., III
Saadi, Mayas
Schreck, Kevin
Schutz, Charles and Bea
Senator Global Opportunity Master Fund LP
Sickle, David B. and Jill
Six Points Capital, LLC
South Dakota Trust Company, Trustee of the Harlan Robins 2017 Trust
Sparks, Andrew
Starnes, Benjamin and Marjorie
Steel, John M.
Sterner, Edwin B.
Sunil Puri Trust Dated August 31, 2004
Susan R. Sullivan Declaration of Trust dated 3/25/1991
SVB Financial Group
SW Secondaries II A LLC
SW Secondaries II B LLC
Sweetwater Revelation, LLC
Sweetwater Secondaries Fund II L.P.
Swerland, Scott
TD Ameritrade Clearing, Inc. as Custodian FBO Charles E. Schutz Roth IRA
The Efrusy Family Trust d/t/d 10-21-2005
The Gruye Living Trust dated May 22, 1992
The Tenenbaum Family Trust
The Weissman 2013 Family Trust
Tiger Partners, L.P.
Tobias, John
Urdea, Mickey
Veljovich, Dan and Natalie
Viking Global Equities II LP
Viking Global Equities Master Ltd.
Viking Global Opportunities Illiquid Investments Sub-Master LP
Viking Long Fund Master Ltd.
Wang, Yingmin
Ward, Eric
Way Family Limited Partnership
Weisman Living Trust dated February 15, 2005, and any amendments thereto
Weissman, Craig
Weng, Li
White Oak Capital LLC
Wigoda, Ellen S.
Willis, Chris
Withycombe, Elizabeth
WS Investment Company, LLC (2009A)
WS Investment Company, LLC (2009C)
WS Investment Company, LLC (2012A)

SCHEDULE A – INVESTORS

Shareholder
WS Investment Company, LLC (2013A)
Youssefnia, David and Shauna
Zheng, Jianbiao
Zoltners, Andris A.
Zona, Joseph

THIS WARRANT AND THE SHARES ISSUABLE HEREUNDER HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "**ACT**"), OR THE SECURITIES LAWS OF ANY STATE AND, EXCEPT AS SET FORTH IN SECTIONS 5.3 AND 5.4 BELOW, MAY NOT BE OFFERED, SOLD, PLEDGED OR OTHERWISE TRANSFERRED UNLESS AND UNTIL REGISTERED UNDER SAID ACT AND LAWS OR IN FORM AND SUBSTANCE SATISFACTORY TO THE COMPANY, SUCH OFFER, SALE, PLEDGE OR OTHER TRANSFER IS EXEMPT FROM SUCH REGISTRATION.

WARRANT TO PURCHASE STOCK

Company: ADAPTIVE BIOTECHNOLOGIES CORPORATION
Number of Shares: 35,032
Type/Series of Stock: Common Stock
Warrant Price: $0.33 per share
Issue Date: June 5th, 2012
Expiration Date: June 5th, 2022 See also Section 5.1(b).
Credit Facility: This Warrant to Purchase Stock ("**Warrant**") is issued in connection with that certain Loan and Security Agreement of even date herewith between Silicon Valley Bank and the Company (the "**Loan Agreement**").

THIS WARRANT CERTIFIES THAT, for good and valuablc consideration, SILICON VALLEY BANK (together with any successor or permitted assignee or transferee of this Warrant or of any shares issued upon exercise hereof, "**Holder**") is entitled to purchase the number of fully paid and non-assessable shares (the "**Shares**") of the above-stated Type/Series of Stock (the "**Class**") of the above-named company (the "**Company**") at the above-stated Warrant Price, all as set forth above and as adjusted pursuant to Section 2 of this Warrant, subject to the provisions and upon the terms and conditions set forth in this Warrant. Reference is made to Section 5.4 of this Warrant whereby Silicon Valley Bank shall transfer this Warrant to its parent company, SVB Financial Group.

SECTION 1. EXERCISE.

1.1 Method of Exercise. Holder may at any time and from time to time exercise this Warrant, in whole or in part, by delivering to the Company the original of this Warrant together with a duly executed Notice of Exercise in substantially the form attached hereto as Appendix 1 and, unless Holder is exercising this Warrant pursuant to a cashless exercise set forth in Section 1.2, a check, wire transfer of same-day funds (to an account designated by the Company), or other form of payment acceptable to the Company for the aggregate Warrant Price for the Shares being purchased.

1.2 Cashless Exercise. On any exercise of this Warrant, in lieu of payment of the aggregate Warrant Price in the manner as specified in Section 1.1 above, but otherwise in accordance with the requirements of Section 1.1, Holder may elect to receive Shares equal to the value of this Warrant, or portion hereof as to which this Warrant is being exercised. Thereupon,

the Company shall issue to the Holder such number of fully paid and non-assessable Shares as are computed using the following formula:

X = Y(A-B)/A

where:

X = the number of Shares to be issued to the Holder;

Y = the number of Shares with respect to which this Warrant is being exercised (inclusive of the Shares surrendered to the Company in payment of the aggregate Warrant Price);

A = the Fair Market Value (as determined pursuant to Section 1.3 below) of one Share; and

B = the Warrant Price.

1.3 Fair Market Value. If the Company's common stock is then traded or quoted on a nationally recognized securities exchange, inter-dealer quotation system or over-the-counter market (a "**Trading Market**") and the Class is common stock, the fair market value of a Share shall be the closing price or last sale price of a share of common stock reported for the Business Day immediately before the date on which Holder delivers this Warrant together with its Notice of Exercise to the Company. If the Company's common stock is not traded in a Trading Market, the Board of Directors of the Company shall determine the fair market value of a Share in its reasonable good faith judgment.

1.4 Delivery of Certificate and New Warrant. Within a reasonable time after Holder exercises this Warrant in the manner set forth in Section 1.1 or 1.2 above, the Company shall deliver to Holder a certificate representing the Shares issued to Holder upon such exercise and, if this Warrant has not been fully exercised and has not expired, a new warrant of like tenor representing the Shares not so acquired.

1.5 Replacement of Warrant. On receipt of evidence reasonably satisfactory to the Company of the loss, theft, destruction or mutilation of this Warrant and, in the case of loss, theft or destruction, on delivery of an indemnity agreement reasonably satisfactory in form, substance and amount to the Company or, in the case of mutilation, on surrender of this Warrant to the Company for cancellation, the Company shall, within a reasonable time, execute and deliver to Holder, in lieu of this Warrant, a new warrant of like tenor and amount.

1.6 Treatment of Warrant Upon Acquisition of Company.

(a) Acquisition. For the purpose of this Warrant, "**Acquisition**" means any transaction or series of related transactions involving: (i) the sale, lease, exclusive license, or other disposition of all or substantially all of the assets of the Company (ii) any merger or consolidation of the Company into or with another person or entity (other than a merger or consolidation effected exclusively to change the Company's domicile), or any other corporate reorganization, in which the stockholders of the Company in their capacity as such immediately

prior to such merger, consolidation or reorganization, own less than a majority of the Company's (or the surviving or successor entity's) outstanding voting power immediately after such merger, consolidation or reorganization; or (iii) any sale or other transfer by the stockholders of the Company of shares representing at least a majority of the Company's then-total outstanding combined voting power.

(b) Treatment of Warrant at Acquisition. In the event of an Acquisition in which the consideration to be received by the Company's stockholders consists solely of cash, solely of Marketable Securities or a combination of cash and Marketable Securities (a "**Cash/Public Acquisition**"), either (i) Holder shall exercise this Warrant pursuant to Section 1.1 and/or 1.2 and such exercise will be deemed effective immediately prior to and contingent upon the consummation of such Acquisition or (ii) if Holder elects not to exercise the Warrant, this Warrant will expire immediately prior to the consummation of such Acquisition.

(c) The Company shall provide Holder with written notice of its request relating to the Cash/Public Acquisition (together with such reasonable information as Holder may reasonably require regarding the treatment of this Warrant in connection with such contemplated Cash/Public Acquisition giving rise to such notice), which is to be delivered to Holder not less than seven (7) Business Days prior to the closing of the proposed Cash/Public Acquisition. In the event the Company does not provide such notice, then if, immediately prior to the Cash/Public Acquisition, the fair market value of one Share (or other security issuable upon the exercise hereof) as determined in accordance with Section 1.3 above would be greater than the Warrant Price in effect on such date, then this Warrant shall automatically be deemed on and as of such date to be exercised pursuant to Section 1.2 above as to all Shares (or such other securities) for which it shall not previously have been exercised, and the Company shall promptly notify the Holder of the number of Shares (or such other securities) issued upon such exercise to the Holder and Holder shall be deemed to have restated each of the representations and warranties in Section 4 of the Warrant as the date thereof.

(d) Upon the closing of any Acquisition other than a Cash/Public Acquisition defined above, the acquiring, surviving or successor entity shall assume the obligations of this Warrant, and this Warrant shall thereafter be exercisable for the same securities and/or other property as would have been paid for the Shares issuable upon exercise of the unexercised portion of this Warrant as if such Shares were outstanding on and as of the closing of such Acquisition, subject to further adjustment from time to time in accordance with the provisions of this Warrant.

(e) As used in this Warrant, "**Marketable Securities**" means securities meeting all of the following requirements: (i) the issuer thereof is then subject to the reporting requirements of Section 13 or Section 15(d) of the Securities Exchange Act of 1934, as amended (the "**Exchange Act**"), and is then current in its filing of all required reports and other information under the Act and the Exchange Act; (ii) the class and series of shares or other security of the issuer that would be received by Holder in connection with the Acquisition were Holder to exercise this Warrant on or prior to the closing thereof is then traded in Trading Market, and (iii) Holder would be able to publicly re-sell, within six (6) months following the closing of such Acquisition, all of the issuer's shares and/or other securities that would be received by Holder in such Acquisition were Holder to exercise this Warrant in full on or prior to the closing of such Acquisition.

SECTION 2. ADJUSTMENTS TO THE SHARES AND WARRANT PRICE.

2.1 Stock Dividends, Splits, Etc. If the Company declares or pays a dividend or distribution on the outstanding shares of the Class payable in common stock or other securities or property (other than cash), then upon exercise of this Warrant, for each Share acquired, Holder shall receive, without additional cost to Holder, the total number and kind of securities and property which Holder would have received had Holder owned the Shares of record as of the date the dividend or distribution occurred. If the Company subdivides the outstanding shares of the Class by reclassification or otherwise into a greater number of shares, the number of Shares purchasable hereunder shall be proportionately increased and the Warrant Price shall be proportionately decreased. If the outstanding shares of the Class are combined or consolidated, by reclassification or otherwise, into a lesser number of shares, the Warrant Price shall be proportionately increased and the number of Shares shall be proportionately decreased.

2.2 Reclassification, Exchange, Combinations or Substitution. Upon any event whereby all of the outstanding shares of the Class are reclassified, exchanged, combined, substituted, or replaced for, into, with or by Company securities of a different class and/or series, then from and after the consummation of such event, this Warrant will be exercisable for the number, class and series of Company securities that Holder would have received had the Shares been outstanding on and as of the consummation of such event, and subject to further adjustment thereafter from time to time in accordance with the provisions of this Warrant. The provisions of this Section 2.2 shall similarly apply to successive reclassifications, exchanges, combinations substitutions, replacements or other similar events.

2.3 Reserved.

2.4 Reserved.

2.5 No Fractional Share. No fractional Share shall be issuable upon exercise of this Warrant and the number of Shares to be issued shall be rounded down to the nearest whole Share. If a fractional Share interest arises upon any exercise of the Warrant, the Company shall eliminate such fractional Share interest by paying Holder in cash the amount computed by multiplying the fractional interest by (i) the fair market value (as determined in accordance with Section 1.3 above) of a full Share, less (ii) the then-effective Warrant Price.

2.6 Notice/Certificate as to Adjustments. Upon each adjustment of the Warrant Price, Class and/or number of Shares, the Company, at the Company's expense, shall notify Holder in writing within a reasonable time setting forth the adjustments to the Warrant Price, Class and/or number of Shares and facts upon which such adjustment is based. The Company shall, upon written request from Holder, furnish Holder with a certificate of its Chief Financial Officer, including computations of such adjustment and the Warrant Price, Class and number of Shares in effect upon the date of such adjustment.

SECTION 3. REPRESENTATIONS AND COVENANTS OF THE COMPANY.

3.1 Representations and Warranties. The Company represents and warrants to, and agrees with, the Holder as follows:

(a) The initial Warrant Price referenced on the first page of this Warrant is not greater than the price per share at which shares of the Class were valued in the most recent 409A valuation of Borrower's stock.

(b) All Shares which may be issued upon the exercise of this Warrant shall, upon issuance pursuant to the terms hereof, be duly authorized, validly issued, fully paid and non-assessable, and free of any liens and encumbrances except for restrictions on transfer provided for herein under applicable federal and state securities laws or created by the Holder. The Company covenants that it shall at all times cause to be reserved and kept available out of its authorized and unissued capital stock such number of shares of the Class, common stock and other securities as will be sufficient to permit the exercise in full of this Warrant and the conversion of the Shares into common stock or such other securities.

(c) The Company's capitalization table attached hereto as Schedule 1 is true and complete, in all material respects, as of the Issue Date.

3.2 Notice of Certain Events. If the Company proposes at any time to:

(a) declare any dividend or distribution upon the outstanding shares of the Class or common stock, whether in cash, property, stock, or other securities and whether or not a regular cash dividend;

(b) offer for subscription or sale pro rata to the holders of the outstanding shares of the Class any additional shares of any class or series of the Company's stock (other than pursuant to contractual pre-emptive rights);

(c) effect any reclassification, exchange, combination, substitution, reorganization or recapitalization of the outstanding shares of the Class;

(d) effect an Acquisition or to liquidate, dissolve or wind up; or

(e) effect an IPO;

then, in connection with each such event, the Company shall give Holder:

(1) at least seven (7) Business Days prior written notice of the date on which a record will be taken for such dividend, distribution, or subscription rights (and specifying the date on which the holders of outstanding shares of the Class will be entitled thereto) or for determining rights to vote, if any, in respect of the matters referred to in (a) and (b) above;

(2) in the case of the matters referred to in (c) and (d) above at least seven (7) Business Days prior written notice of the date when the same will take place (and specifying the date on which the holders of outstanding shares of the Class will be entitled to exchange their shares for the securities or other property deliverable upon the occurrence of such event); and

(3) with respect to the IPO, at least seven (7) Business Days prior written notice of the date on which the Company proposes to file its registration statement in connection therewith.

Reference is made to Section 1.6(c) whereby this Warrant will be deemed to be exercised pursuant to Section 1.2 hereof if the Company does not give written notice to Holder of a Cash/Public Acquisition as required by the terms hereof. Company will also provide information requested by Holder that is reasonably necessary to enable Holder to comply with Holder's accounting or reporting requirements.

SECTION 4. REPRESENTATIONS, WARRANTIES OF THE HOLDER.

The Holder represents and warrants to the Company as follows:

4.1 Purchase for Own Account. This Warrant and the securities to be acquired upon exercise of this Warrant by Holder are being acquired for investment for Holder's account, not as a nominee or agent, and not with a view to the public resale or distribution within the meaning of the Act. Holder also represents that it has not been formed for the specific purpose of acquiring this Warrant or the Shares.

4.2 Disclosure of Information. Holder is aware of the Company's business affairs and financial condition and has received or has had full access to all the information it considers necessary or appropriate to make an informed investment decision with respect to the acquisition of this Warrant and its underlying securities. Holder further has had an opportunity to ask questions and receive answers from the Company regarding the terms and conditions of the offering of this Warrant and its underlying securities and to obtain additional information (to the extent the Company possessed such information or could acquire it without unreasonable effort or expense) necessary to verify any information furnished to Holder or to which Holder has access.

4.3 Investment Experience. Holder understands that the purchase of this Warrant and its underlying securities involves substantial risk. Holder has experience as an investor in securities of companies in the development stage and acknowledges that Holder can bear the economic risk of such Holder's investment in this Warrant and its underlying securities and has such knowledge and experience in financial or business matters that Holder is capable of evaluating the merits and risks of its investment in this Warrant and its underlying securities and/or has a preexisting personal or business relationship with the Company and certain of its officers, directors or controlling persons of a nature and duration that enables Holder to be aware of the character, business acumen and financial circumstances of such persons.

4.4 Accredited Investor Status. Holder is an "accredited investor" within the meaning of Regulation D promulgated under the Act.

4.5 The Act. Holder understands that this Warrant and the Shares issuable upon exercise hereof have not been registered under the Act in reliance upon a specific exemption therefrom, which exemption depends upon, among other things, the bona fide nature of the

Holder's investment intent as expressed herein. Holder understands that this Warrant and the Shares issued upon any exercise hereof must be held indefinitely unless subsequently registered under the Act and qualified under applicable state securities laws, or unless exemption from such registration and qualification are otherwise available. Holder is aware of the provisions of Rule 144 promulgated under the Act.

4.6 Market Stand-off Agreement. The Holder agrees that the Shares shall be subject to the Market Standoff provisions in Section 2.12 of the Company's Amended and Restated Investors' Rights Agreement, dated as of May 20, 2011, as amended.

4.7 No Voting Rights. Holder, as a Holder of this Warrant, will not have any voting rights until the exercise of this Warrant.

SECTION 5. MISCELLANEOUS.

5.1 Term and Automatic Conversion Upon Expiration.

(a) Term. Subject to the provisions of Section 1.6 above, this Warrant is exercisable in whole or in part at any time and from time to time on or before 6:00 PM, Pacific time, on the Expiration Date and shall be void thereafter.

(b) Automatic Cashless Exercise upon Expiration. In the event that, upon the Expiration Date, the fair market value of one Share (or other security issuable upon the exercise hereof) as determined in accordance with Section 1.3 above is greater than the Warrant Price in effect on such date, then this Warrant shall automatically be deemed on and as of such date to be exercised pursuant to Section 1.2 above as to all Shares (or such other securities) for which it shall not previously have been exercised, and the Company shall, within a reasonable time, deliver a certificate representing the Shares (or such other securities) issued upon such exercise to Holder.

5.2 Legends. The Shares (and the securities issuable, directly or indirectly, upon conversion of the Shares, if any) shall be imprinted with a legend in substantially the following form:

> THE SHARES EVIDENCED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "**ACT**"), OR THE SECURITIES LAWS OF ANY STATE AND, EXCEPT AS SET FORTH IN THAT CERTAIN WARRANT TO PURCHASE STOCK ISSUED BY THE ISSUER TO SILICON VALLEY BANK DATED JUNE 5TH, 2012, MAY NOT BE OFFERED, SOLD, PLEDGED OR OTHERWISE TRANSFERRED UNLESS AND UNTIL REGISTERED UNDER SAID ACT AND LAWS OR IN FORM AND SUBSTANCE SATISFACTORY TO THE ISSUER, SUCH OFFER, SALE, PLEDGE OR OTHER TRANSFER IS EXEMPT FROM SUCH REGISTRATION.

5.3 Compliance with Securities Laws on Transfer. This Warrant and the Shares issuable upon exercise of this Warrant may not be transferred or assigned in whole or in part except in compliance with applicable federal and state securities laws by the transferor and the transferee

(including, without limitation, the delivery of investment representation letters and legal opinions reasonably satisfactory to the Company, as reasonably requested by the Company). The Company shall not require Holder to provide an opinion of counsel if the transfer is to SVB Financial Group (Silicon Valley Bank's parent company) or any other affiliate of Holder, provided that any such transferee is an "accredited investor" as defined in Regulation D promulgated under the Act. Additionally, the Company shall also not require an opinion of counsel if there is no material question as to the availability of Rule 144 promulgated under the Act.

5.4 Transfer Procedure. After receipt by Silicon Valley Bank of the executed Warrant, Silicon Valley Bank will transfer all of this Warrant to its parent company, SVB Financial Group. By its acceptance of this Warrant, SVB Financial Group hereby makes to the Company each of the representations and warranties set forth in Section 4 hereof and agrees to be bound by all of the terms and conditions of this Warrant as if the original Holder hereof. Subject to the provisions of Section 5.3 and upon providing the Company with written notice, SVB Financial Group and any subsequent Holder may transfer all or part of this Warrant or the Shares issuable upon exercise of this Warrant to any transferee, provided, however, in connection with any such transfer, SVB Financial Group or any subsequent Holder will give the Company notice of the portion of the Warrant being transferred with the name, address and taxpayer identification number of the transferee and Holder will surrender this Warrant to the Company for reissuance to the transferee(s) (and Holder if applicable); and provided further, that any subsequent transferee other than SVB Financial Group shall agree in writing with the Company to be bound by all of the terms and conditions of this Warrant. Notwithstanding any contrary provision herein, at all times prior to the IPO, Holder may not, without the Company's prior written consent, transfer this Warrant or any portion hereof, or any Shares issued upon any exercise hereof, to any person or entity who directly competes with the Company, except in connection with an Acquisition of the Company by such a direct competitor.

5.5 Notices. All notices and other communications hereunder from the Company to the Holder, or vice versa, shall be deemed delivered and effective (i) when given personally, (ii) on the third (3rd) Business Day after being mailed by first-class registered or certified mail, postage prepaid, (iii) upon actual receipt if given by facsimile or electronic mail and such receipt is confirmed in writing by the recipient, or (iv) on the first Business Day following delivery to a reliable overnight courier service, courier fee prepaid, in any case at such address as may have been furnished to the Company or Holder, as the case may be, in writing by the Company or such Holder from time to time in accordance with the provisions of this Section 5.5. All notices to Holder shall be addressed as follows until the Company receives notice of a change of address in connection with a transfer or otherwise:

SVB Financial Group
Attn: Treasury Department
3003 Tasman Drive, HC 215
Santa Clara, CA 95054
Telephone: (408) 654-7400
Facsimile: (408) 988-8317
Email address: derivatives @svb.com

Notice to the Company shall be addressed as follows until Holder receives notice of a change in address:

Adaptive Biotechnologies Corporation
Attn: Chad Robins
1551 Eastlake Avenue East, Suite 200
Seattle, WA 98102
Telephone:
Facsimile:
Email:

5.6 Waiver. This Warrant and any term hereof may be changed, waived, discharged or terminated (either generally or in a particular instance and either retroactively or prospectively) only by an instrument in writing signed by the party against which enforcement of such change, waiver, discharge or termination is sought.

5.7 Attorney's Fees. In the event of any dispute between the parties concerning the terms and provisions of this Warrant, the party prevailing in such dispute shall be entitled to collect from the other party all costs incurred in such dispute, including reasonable attorneys' fees.

5.8 Counterparts; Facsimile/Electronic Signatures. This Warrant may be executed in counterparts, all of which together shall constitute one and the same agreement. Any signature page delivered electronically or by facsimile shall be binding to the same extent as an original signature page with regards to any agreement subject to the terms hereof or any amendment thereto.

5.9 Governing Law. This Warrant shall be governed by and construed in accordance with the laws of the State of California, without giving effect to its principles regarding conflicts of law.

5.10 Headings. The headings in this Warrant are for purposes of reference only and shall not limit or otherwise affect the meaning of any provision of this Warrant.

5.11 Business Days. "**Business Day**" is any day that is not a Saturday, Sunday or a day on which Silicon Valley Bank is closed.

[Remainder of page left blank intentionally]
[Signature page follows]

IN WITNESS WHEREOF, the parties have caused this Warrant to Purchase Stock to be executed by their duly authorized representatives effective as of the Issue Date written above.

"COMPANY"

ADAPTIVE BIOTECHNOLOGIES CORPORATION

By: /s/ Chad M. Robins
Name: Chad M. Robins
(Print)
Title:

"HOLDER"

SILICON VALLEY BANK

By: /s/ Jayson Davis
Name: Jayson Davis
(Print)
Title: Relationship Manager

APPENDIX 1

NOTICE OF EXERCISE

1. The undersigned Holder hereby exercises its right purchase shares of the Common Stock of ADAPTIVE BIOTECHNOLOGIES CORPORATION (the "**Company**") in accordance with the attached Warrant To Purchase Stock, and tenders payment of the aggregate Warrant Price for such shares as follows:

☐ check in the amount of $ payable to order of the Company enclosed herewith

☐ Wire transfer of immediately available funds to the Company's account

☐ Cashless Exercise pursuant to Section 1.2 of the Warrant

☐ Other [Describe] _____

2. Please issue a certificate or certificates representing the Shares in the name specified

_____

Holder's Name

_____

_____

(Address)

3. By its execution below and for the benefit of the Company, Holder hereby restates each of the representations and warranties in Section 4 of the Warrant to Purchase Stock as of the date hereof.

HOLDER:

_____

By: _____

Name: _____

Title: _____

(Date): _____

SCHEDULE 1

Company Capitalization Table

See attached

Schedule 1

Warrant

THIS WARRANT AND THE SECURITIES ISSUABLE UPON EXERCISE OF THIS WARRANT HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "ACT"), OR UNDER THE SECURITIES LAWS OF APPLICABLE STATES. THESE SECURITIES ARE SUBJECT TO RESTRICTIONS ON TRANSFERABILITY AND RESALE AND MAY NOT BE TRANSFERRED OR RESOLD EXCEPT AS PERMITTED UNDER THE ACT AND THE APPLICABLE STATE SECURITIES LAWS, PURSUANT TO REGISTRATION OR EXEMPTION THEREFROM. INVESTORS SHOULD BE AWARE THAT THEY MAY BE REQUIRED TO BEAR THE FINANCIAL RISKS OF THIS INVESTMENT FOR AN INDEFINITE PERIOD OF TIME. THE ISSUER OF THESE SECURITIES MAY REQUIRE AN OPINION OF COUNSEL IN FORM AND SUBSTANCE SATISFACTORY TO THE ISSUER TO THE EFFECT THAT ANY PROPOSED TRANSFER OR RESALE IS IN COMPLIANCE WITH THE ACT AND ANY APPLICABLE STATE SECURITIES LAWS.

WARRANT TO PURCHASE COMMON STOCK OF
ADAPTIVE BIOTECHNOLOGIES CORPORATION

This certifies that for good and valuable consideration, Imdaptive, Inc. is entitled, subject to the terms and conditions of this Warrant, to purchase from Adaptive Biotechnologies Corporation, a Washington Corporation (the "***Company***"), at any time or from time to time prior to the earlier to occur of (i) the effective date of a Change of Control, (ii) the effective date of an Initial Public Offering, or (iii) 5:00 p.m. Pacific time on July 1, 2023 (the "***Expiration Date***"), up to 20,000 shares of Warrant Stock (as defined below) at a price per share equal to the Warrant Price (as defined below), upon surrender of this Warrant at the principal offices of the Company, together with a duly executed subscription form in the form attached hereto as Exhibit 1 and simultaneous payment of the full Warrant Price for the shares of Warrant Stock so purchased in accordance with the terms hereof. The Warrant Price and the number and character of shares of Warrant Stock purchasable under this Warrant are subject to adjustment as provided herein.

1. **DEFINITIONS**. The following definitions shall apply for purposes of this Warrant:

1.1 "***Holder***" means any person who shall at the time be the registered holder of this Warrant.

1.2 "***Initial Public Offering***" means the initial firm commitment underwritten public offering of the Company pursuant to an effective registration statement filed under the Securities Act of 1933, as amended (the "***1933 Act***"), covering the offer and sale of the Company's Common Stock for the account of the Company.

1.3 "***Change of Control***" shall mean each of: (a) any sale or exchange of the capital stock by the stockholders of the Company in one transaction or series of related transactions where more than 50% of the outstanding voting power of the Company is acquired by a person or entity or group of related persons or entities; (b) a consolidation, merger or other reorganization of

the Company with or into any other corporation or corporations in which the holders of the Company's outstanding shares immediately before such consolidation, merger or other reorganization do not, immediately after such consolidation, merger or reorganization, retain stock representing a majority of the voting power of the surviving corporation of such consolidation, merger or reorganization as a result of their shareholdings in the Company immediately prior to the consolidation or merger; or (c) a sale of all or substantially all of the assets of the Company and its subsidiaries, on a consolidated basis; provided, however, that a Change in Control shall not include an equity or debt financing the primary purpose of which is to raise working capital for the Company.

1.4 "***Warrant Price***" means $0.45 per share. The Warrant Price is subject to further adjustment as provided herein.

1.5 "***Warrant Stock***" means 20,000 shares of the Company's Common Stock subject to this Warrant. The number and character of shares of Warrant Stock are subject to adjustment as provided herein and the term "***Warrant Stock***" shall include stock and other securities and property at any time receivable or issuable upon exercise of this Warrant in accordance with its terms.

2. **EXERCISE**.

2.1 **Exercisability**. Holder may exercise this Warrant in whole or in part, at any time or from time to time, on any business day before the Expiration Date, by surrendering this Warrant at the principal offices of the Company, with the subscription form attached hereto duly executed by the Holder, and payment of an amount equal to the product obtained by multiplying (i) the number of shares of Warrant Stock to be purchased by the Holder by (ii) the Warrant Price or adjusted Warrant Price therefor, if applicable, as determined in accordance with the terms hereof.

2.2 **Form of Payment**. Payment may be made by (i) a check payable to the Company's order, (ii) wire transfer of funds to the Company, (iii) cancellation of indebtedness of the Company to the Holder, (iv) net exercise as provided for in Section 2.6, or (v) any combination of the foregoing.

2.3 **Partial Exercise**. Upon a partial exercise of this Warrant the number of shares of Warrant Stock issuable upon exercise of this Warrant immediately prior to such exercise shall be reduced by (i) the aggregate number of shares of Warrant Stock issued upon such exercise of this Warrant and (ii) if applicable, the number of Warrants deemed surrendered in connection with a net exercise as provided for in Section 2.6.

2.4 **No Fractional Shares**. No fractional shares may be issued upon any exercise of this Warrant, and any fractions shall be rounded down to the nearest whole number of shares. If upon any exercise of this Warrant a fraction of a share results, the Company will pay the cash value of any such fractional share.

2.5 **Restrictions on Exercise**. This Warrant may not be exercised if the issuance of the Warrant Stock upon such exercise would constitute a violation of any applicable federal or state securities laws or other laws or regulations. As a condition to the exercise of this

Warrant, the Holder shall execute the subscription form attached hereto as Exhibit 1, confirming and acknowledging that the representations and warranties of the Holder set forth in Section 6 of this Warrant are true and correct as of the date of exercise.

2.6 **Net Exercise Election**. The Holder may elect to convert this Warrant, without the payment by the Holder of any additional consideration, by the surrender of this Warrant to the Company, with the net exercise election selected in the subscription form attached hereto duly executed by the Holder, into the number of shares of Warrant Stock that is obtained under the following formula:

$$X = \frac{Y\,(A - B)}{A}$$

where X = the number of shares of Warrant Stock to be issued to the Holder pursuant to this Section 2.6.

Y = the number of shares of Warrant Stock as to which this Warrant is then being net exercised

A = the fair market value of one share of Warrant Stock, as determined in good faith by the Company's Board of Directors, as at the time the net exercise election is made pursuant to this Section 2.6.

B = the Warrant Price.

The Company will promptly respond in writing to an inquiry by the Holder as to the then current fair market value of one share of Warrant Stock.

3. **ISSUANCE OF STOCK**. This Warrant shall be deemed to have been exercised immediately prior to the close of business on the date that a duly completed and executed Form of Subscription in the form attached hereto as Exhibit 1 and payment of the full Warrant Price in accordance with this Warrant have been delivered to the Company, whereupon the person entitled to receive the shares of Warrant Stock issuable upon such exercise shall be treated for all purposes as the holder of record of such shares as of the close of business on such date. As soon as practicable on or after such date, but conditioned upon the receipt of this Warrant by the Company, the Company shall issue and deliver to the person or persons entitled to receive the same a certificate or certificates for the number of whole shares of Warrant Stock issuable upon such exercise.

4. **EARLY EXPIRATION**. This Warrant shall automatically expire and be of no further force and effect without any action by the Company or the Holder immediately prior to the effective date of a Change of Control or Initial Public Offering. If the Company proposes at any time to effect a Change of Control or Initial Public Offering, then at least thirty (30) days prior to such event the Company shall mail to the Holder a notice specifying the date on which the Change of Control or Initial Public Offering is anticipated to become effective.

5. **ADJUSTMENT PROVISIONS**. The number and character of shares of Warrant Stock issuable upon exercise of this Warrant (or any shares of stock or other securities or property at the time receivable or issuable upon exercise of this Warrant) and the Warrant Price therefor,

are subject to adjustment upon the occurrence of the following events between the date this Warrant is issued and the date it is exercised:

5.1 **Adjustment for Stock Splits, Stock Dividends, Recapitalizations, etc**. The Warrant Price of this Warrant and the number of shares of Warrant Stock issuable upon exercise of this Warrant (or any shares of stock or other securities at the time issuable upon exercise of this Warrant) shall each be proportionally adjusted to reflect any stock dividend, stock split, reverse stock split, reclassification, recapitalization or other similar event affecting the number of outstanding shares of Warrant Stock (or such other stock or securities).

5.2 **Adjustment for Other Dividends and Distributions**. In case the Company shall make or issue, or shall fix a record date for the determination of eligible holders entitled to receive, a dividend or other distribution payable respect to the Warrant Stock that is payable in (a) securities of the Company (other than issuances with respect to which adjustment is made under Section 5.1), or (b) assets (other than cash dividends paid or payable solely out of retained earnings), then, and in each such case, the Holder, upon exercise of this Warrant at any time after the consummation, effective date or record date of such event, shall receive, in addition to the shares of Warrant Stock issuable upon such exercise prior to such date, the securities or such other assets of the Company to which the Holder would have been entitled upon such date if the Holder had exercised this Warrant immediately prior thereto (all subject to further adjustment as provided in this Warrant).

5.3 **Adjustment for Reorganization, Consolidation, Merger**. Other than any reorganization, consolidation or merger that constitutes a Change of Control, in case of any reorganization of the Company (or of any other corporation, the stock or other securities of which are at the time receivable on the exercise of this Warrant), after the date of this Warrant, or in case, after such date, the Company (or any such corporation) shall consolidate with or merge into another corporation or convey all or substantially all of its assets to another corporation and then distribute the proceeds to its shareholders, then, and in each such case, the Holder, upon the exercise of this Warrant (as provided in Section 2), at any time after the consummation of such reorganization, consolidation, merger or conveyance, shall be entitled to receive, in lieu of the stock or other securities and property receivable upon the exercise of this Warrant prior to such consummation, the stock or other securities or property to which the Holder would have been entitled upon the consummation of such reorganization, consolidation, merger or conveyance if the Holder had exercised this Warrant immediately prior thereto, all subject to further adjustment as provided in this Warrant, and the successor or purchasing corporation in such reorganization, consolidation, merger or conveyance (if other than the Company) shall duly execute and deliver to the Holder a supplement hereto acknowledging such corporation's obligations under this Warrant; and in each such case, the terms of this Warrant shall be applicable to the shares of stock or other securities or property receivable upon the exercise of this Warrant after the consummation of such reorganization, consolidation, merger or conveyance.

5.4 **Notice of Adjustments**. The Company shall promptly give written notice of each adjustment or readjustment of the Warrant Price or the number of shares of Warrant Stock or other securities issuable upon exercise of this Warrant. The notice shall describe the adjustment or readjustment and show in reasonable detail the facts on which the adjustment or readjustment is based.

5.5 **No Change Necessary**. The form of this Warrant need not be changed because of any adjustment in the Warrant Price or in the number of shares of Warrant Stock issuable upon its exercise.

5.6 **Reservation of Stock**. If at any time the number of shares of Warrant Stock or other securities issuable upon exercise of this Warrant shall not be sufficient to effect the exercise of this Warrant, the Company will take such corporate action as may, in the opinion of its counsel, be necessary to increase its authorized but unissued shares of Warrant Stock or other securities issuable upon exercise of this Warrant as shall be sufficient for such purpose.

6. **REPRESENTATIONS AND WARRANTIES OF HOLDER**. Holder hereby represents and warrants to, and agrees with, the Company, that:

6.1 **Purchase for Own Account**. The Warrant and the Warrant Stock (collectively, the "*Securities*") will be acquired for investment for Holder's own account, not as a nominee or agent, and not with a view to the public resale or distribution thereof within the meaning of the 1933 Act, and such Holder has no present intention of selling, granting any participation in, or otherwise distributing the same.

6.2 **Disclosure of Information**. Holder has received or has had full access to all the information it considers necessary or appropriate to make an informed investment decision with respect to the Securities. Holder further has had an opportunity to ask questions and receive answers from the Company regarding the terms and conditions of the offering of the Securities and to obtain additional information (to the extent the Company possessed such information or could acquire it without unreasonable effort or expense) necessary to verify any information furnished to Holder or to which Holder had access.

6.3 **Investment Experience**. Holder understands that the purchase of the Securities involves substantial risk. Holder (i) has experience as an investor in securities of companies in the development stage and acknowledges that Holder is able to fend for itself, can bear the economic risk of Holder's investment in the Securities and has such knowledge and experience in financial or business matters that Holder is capable of evaluating the merits and risks of this investment in the Securities and protecting its own interests in connection with this investment and/or (ii) has a preexisting personal or business relationship with the Company and certain of its officers, directors or controlling persons of a nature and duration that enables such Holder to be aware of the character, business acumen and financial circumstances of such persons.

6.4 **Restricted Securities**. Holder understands that the Securities are characterized as "restricted securities" under the 1933 Act and Rule 144 promulgated thereunder inasmuch as they are being acquired from the Company in a transaction not involving a public offering, and that under the 1933 Act and applicable regulations thereunder such securities may be resold without registration under the 1933 Act only in certain limited circumstances. In this connection, Holder is familiar with Rule 144, as presently in effect, and understands the resale limitations imposed thereby and by the 1933 Act. Holder understands that the Company is under no obligation to register any of the securities sold hereunder. Holder understands that no public market now exists for any of the Securities and that it is uncertain whether a public market will ever exist for the Securities.

6.5 **No Solicitation**. At no time was the Holder presented with or solicited by any publicly issued or circulated newspaper, mail, radio, television or other form of general advertising or solicitation in connection with the offer, sale and purchase of the Securities.

6.6 **Further Limitations on Disposition**. Without in any way limiting the representations set forth above, Holder further agrees not to make any disposition of all or any portion of the Securities unless and until: (a) there is then in effect a registration statement under the 1933 Act covering such proposed disposition and such disposition is made in accordance with such registration statement; or (b) Holder shall have notified the Company of the proposed disposition, and shall have furnished the Company with a statement of the circumstances surrounding the proposed disposition, and, upon request of the Company, with an opinion of counsel, at the expense of Holder or its transferee, reasonably satisfactory to the Company, that such disposition will not require registration of such securities under the 1933 Act. Notwithstanding the provisions of paragraphs (a) and (b) above, no such registration statement or opinion of counsel shall be required: (i) for any transfer of the Securities in compliance with Rule 144 or Rule 144A; or (ii) for any transfer of the Securities by Holder that is a partnership or a corporation to (A) a partner of such partnership or shareholder of such corporation, (B) a controlled affiliate of such partnership or corporation, (C) a retired partner of such partnership who retires after the date hereof, (D) the estate of any such partner or shareholder; or (iii) for the transfer by gift, will or intestate succession by Holder to his or her spouse or lineal descendants or ancestors or any trust for any of the foregoing; provided that in each of the foregoing cases the transferee agrees in writing to be subject to the restrictions on transfer set forth in this Section 6 to the same extent as if the transferee were an original Holder hereunder.

6.7 **Legends**. Such Holder understands and agrees that the certificates evidencing the Securities will bear legends substantially similar to those set forth below in addition to any other legend that may be required by applicable law, by the Company's Certificate of Incorporation or Bylaws, or by any agreement between the Company and such Holder:

(a) THE SECURITIES REPRESENTED HEREBY HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "ACT"), OR UNDER THE SECURITIES LAWS OF APPLICABLE STATES. THESE SECURITIES ARE SUBJECT TO RESTRICTIONS ON TRANSFERABILITY AND RESALE AND MAY NOT BE TRANSFERRED OR RESOLD EXCEPT AS PERMITTED UNDER THE ACT AND THE APPLICABLE STATE SECURITIES LAWS, PURSUANT TO REGISTRATION OR EXEMPTION THEREFROM. INVESTORS SHOULD BE AWARE THAT THEY MAY BE REQUIRED TO BEAR THE FINANCIAL RISKS OF THIS INVESTMENT FOR AN INDEFINITE PERIOD OF TIME. THE ISSUER OF THESE SECURITIES MAY REQUIRE AN OPINION OF COUNSEL IN FORM AND SUBSTANCE SATISFACTORY TO THE ISSUER TO THE EFFECT THAT ANY PROPOSED TRANSFER OR RESALE IS IN COMPLIANCE WITH THE ACT.

(b) Any legend required by the laws of the State of Washington, including any legend required by the Washington Department of Corporations and Sections 417 and 418 of the Washington Corporations Code or any other state securities laws.

The legend set forth in (a) above shall be removed by the Company from any certificate evidencing the Securities upon delivery to the Company of an opinion of counsel, reasonably satisfactory to the Company, that a registration statement under the 1933 Act is at that time in

effect with respect to the legended security or that such security can be freely transferred in a public sale (other than pursuant to Rule 144 or Rule 145 under the 1933 Act) without such a registration statement being in effect and that such transfer will not jeopardize the exemption or exemptions from registration pursuant to which the Company issued the Securities. No opinion shall be required for routine transactions under Rule 144.

6.8 **Market Stand-Off Agreement**. Holder hereby agrees that it shall not, to the extent requested by the Company or an underwriter of securities of the Company, sell or otherwise transfer or dispose of any Securities or other shares of stock of the Company then owned by such Holder (other than to donees or partners of Holder who agree to be similarly bound) for up to one hundred eighty (180) days following the effective date of a registration statement of the Company filed under the 1933 Act. For purposes of this Section 6.8, the term "**Company**" shall include any wholly-owned subsidiary of the Company into which the Company merges or consolidates. In order to enforce the foregoing covenant, the Company shall have the right to place the following restrictive legend on the certificates representing the shares subject to this Section and to impose stop transfer instructions with respect to the Securities and such other Company securities of Holder (and the shares or securities of every other person subject to the foregoing restriction) until the end of such period. Holder further agrees to enter into any agreement reasonably required by the underwriters to implement the foregoing within any reasonable timeframe so requested.

THE SHARES REPRESENTED BY THIS CERTIFICATE ARE SUBJECT TO A 180 DAY MARKET STAND-OFF RESTRICTION AS SET FORTH IN A CERTAIN AGREEMENT BETWEEN THE ISSUER AND THE ORIGINAL HOLDER OF THESE SHARES, A COPY OF WHICH MAY BE OBTAINED AT THE PRINCIPAL OFFICE OF THE ISSUER. AS A RESULT OF SUCH AGREEMENT, THESE SHARES MAY NOT BE TRADED PRIOR TO 180 DAYS AFTER THE EFFECTIVE DATE OF THE PUBLIC OFFERING OF THE COMMON STOCK OF THE ISSUER HEREOF. SUCH RESTRICTION IS BINDING ON TRANSFEREES OF THESE SHARES.

7. **NO RIGHTS OR LIABILITIES AS SHAREHOLDER**. This Warrant does not by itself entitle the Holder to any voting rights or other rights as a shareholder of the Company. In the absence of affirmative action by the Holder to purchase Warrant Stock by exercise of this Warrant, no provisions of this Warrant, and no enumeration herein of the rights or privileges of the Holder, shall cause the Holder to be a shareholder of the Company for any purpose.

8. **ATTORNEYS' FEES**. In the event any party is required to engage the services of any attorneys for the purpose of enforcing this Warrant, or any provision thereof, the prevailing party shall be entitled to recover its reasonable expenses and costs in enforcing this Warrant, including attorneys' fees.

9. **TRANSFER**. Except as expressly provided hereunder, neither this Warrant nor any rights hereunder may be assigned, conveyed or transferred by Holder, in whole or in part, without the Company's prior written consent, which the Company may withhold in its sole discretion. The rights and obligations of the Company and the Holder under this Warrant shall be binding upon and benefit their respective permitted successors, assigns, heirs, administrators and transferees.

10. **GOVERNING LAW**. This Warrant shall be governed by and construed under the internal laws of the State of Washington as applied to agreements among Washington residents entered into and to be performed entirely within Washington, without reference to principles of conflict of laws or choice of laws.

11. **NOTICES**. Unless otherwise provided, any notice required or permitted under this Agreement shall be given in writing and shall be deemed effectively given (i) at the time of personal delivery, if delivery is in person; (ii) one (1) business day after deposit with an express overnight courier for United States deliveries, or two (2) business days after such deposit for deliveries outside of the United States, with proof of delivery from the courier requested; or (iii) three (3) business days after deposit in the United States mail by certified mail (return receipt requested) for United States deliveries when addressed to the party to be notified at the address indicated for such party on the signature page hereto, or at such other address as any party or the Company may designate by giving ten (10) days' advance written notice to all other parties.

12. **AMENDMENT; WAIVER**. Any term of this Warrant may be amended, and the observance of any term of this Warrant may be waived (either generally or in a particular instance and either retroactively or prospectively) only with the written consent of the Company and the Holder. Any amendment or waiver effected in accordance with this Section shall be binding upon the Holder.

13. **SEVERABILITY**. If one or more provisions of this Warrant are held to be unenforceable under applicable law, such provision(s) shall be excluded from this Warrant and the balance of the Warrant shall be interpreted as if such provision(s) were so excluded and shall be enforceable in accordance with its terms.

14. **TERMS BINDING**. By acceptance of this Warrant, the Holder accepts and agrees to be bound by all the terms and conditions of this Warrant.

15. **ENTIRE AGREEMENT**. This Warrant constitutes the entire agreement and understanding of the parties with respect to the subject matter hereof and supersedes any and all prior negotiations, correspondence, warrants, agreements, understandings duties or obligations between the parties with respect to the subject matter hereof.

[Remainder of Page Intentionally Left Blank]

IN WITNESS WHEREOF, the parties hereto have executed this Warrant as of the date first above written.

THE COMPANY:

ADAPTIVE BIOTECHNOLOGIES CORPORATION

By: /s/ Chad Robins
Name: Chad Robins
Title: CEO & President

Address:

1551 Eastlake Avenue East, Suite 200
Seattle, WA 98102

AGREED AND ACKNOWLEDGED

THE HOLDER

IMDAPTIVE, INC.

By: /s/ Steven R. Wiley
Name: Steven R. Wiley
Title: President
Address: 3010 NW 56th St.

EXHIBIT 1

FORM OF SUBSCRIPTION
(To be signed only upon exercise of Warrant)

To: Adaptive Biotechnologies Corporation

(1) The undersigned Holder hereby elects to purchase _____ shares of Common Stock of Adaptive Biotechnologies Corporation (the "**Warrant Stock**"), pursuant to the terms of the attached Warrant, and tenders herewith payment of the purchase price for such shares in full.

(2) Net Exercise Election. The undersigned Holder elects to convert the Warrant into shares of Warrant Stock by net exercise election pursuant to Section 2.6 of the Warrant. This conversion is exercised with respect to _____ shares of **Warrant Stock**.

(3) In exercising the Warrant, the undersigned Holder hereby confirms and acknowledges that the representations and warranties set forth in Section 6 of the Warrant as they apply to the undersigned Holder continue to be true and correct as of this date.

(4) Please issue a certificate or certificates representing such shares of Warrant Stock in the name or names specified below:

(Name)	(Name)
(Address)	(Address)
(City, State, Zip Code)	(City, State, Zip Code)
(Federal Tax Identification Number)	(Federal Tax Identification Number)
(Date)	(Date)

THIS WARRANT AND THE SHARES ISSUABLE HEREUNDER HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "**ACT**"), OR THE SECURITIES LAWS OF ANY STATE AND, EXCEPT AS SET FORTH IN SECTIONS 5.3 AND 5.4 BELOW, MAY NOT BE OFFERED, SOLD, PLEDGED OR OTHERWISE TRANSFERRED UNLESS AND UNTIL REGISTERED UNDER SAID ACT AND LAWS OR IN FORM AND SUBSTANCE SATISFACTORY TO THE COMPANY, SUCH OFFER, SALE, PLEDGE OR OTHER TRANSFER IS EXEMPT FROM SUCH REGISTRATION.

WARRANT TO PURCHASE STOCK

Company: ADAPTIVE BIOTECHNOLOGIES CORPORATION
Number of Shares: 56,875
Type/Series of Stock: Series C Preferred Stock
Warrant Price: $2.6374 per share
Issue Date: April 21, 2014
Expiration Date: April 21, 2021 See also Section 5.1(b).
Credit Facility: This Warrant to Purchase Stock ("**Warrant**") is issued in connection with that certain Loan and Security Agreement of even date herewith between Alexandria Equities, LLC and the Company (the "**Loan Agreement**").

THIS WARRANT CERTIFIES THAT, for good and valuable consideration, Alexandria Equities, LLC (together with any successor or permitted assignee or transferee of this Warrant or of any shares issued upon exercise hereof, "**Holder**") is entitled to purchase the number of fully paid and non-assessable shares (the "**Shares**") of the above-stated Type/Series of Stock (the "**Class**") of the above-named company (the "**Company**") at the above-stated Warrant Price, all as set forth above and as adjusted pursuant to Section 2 of this Warrant, subject to the provisions and upon the terms and conditions set forth in this Warrant.

SECTION 1. EXERCISE.

1.1 Method of Exercise. Holder may at any time and from time to time exercise this Warrant, in whole or in part, by delivering to the Company the original of this Warrant together with a duly executed Notice of Exercise in substantially the form attached hereto as Appendix 1 and, unless Holder is exercising this Warrant pursuant to a cashless exercise set forth in Section 1.2, a check, wire transfer of same-day funds (to an account designated by the Company), or other form of payment acceptable to the Company for the aggregate Warrant Price for the Shares being purchased.

1.2 Cashless Exercise. On any exercise of this Warrant, in lieu of payment of the aggregate Warrant Price in the manner as specified in Section 1.1 above, but otherwise in accordance with the requirements of Section 1.1, Holder may elect to receive Shares equal to the value of this Warrant, or portion hereof as to which this Warrant is being exercised. Thereupon,

the Company shall issue to the Holder such number of fully paid and non-assessable Shares as are computed using the following formula:

X = Y(A-B)/A

where:

X = the number of Shares to be issued to the Holder;

Y the number of Shares with respect to which this Warrant is being exercised (inclusive of the Shares surrendered to the Company in payment of the aggregate Warrant Price);

A = the Fair Market Value (as determined pursuant to Section 1.3 below) of one Share; and

B = the Warrant Price.

1.3 Fair Market Value. If the Company's common stock is then traded or quoted on a nationally recognized securities exchange, inter-dealer quotation system or over-the-counter market (a "**Trading Market**") and the Class is common stock, the fair market value of a Share shall be the closing price or last sale price of a share of common stock reported for the Business Day immediately before the date on which Holder delivers this Warrant together with its Notice of Exercise to the Company. If the Company's common stock is not traded in a Trading Market or the Class is not common stock, the Board of Directors of the Company shall determine the fair market value of a Share in its reasonable good faith judgment.

1.4 Delivery of Certificate and New Warrant. Within a reasonable time after Holder exercises this Warrant in the manner set forth in Section 1.1 or 1.2 above, the Company shall deliver to Holder a certificate representing the Shares issued to Holder upon such exercise and, if this Warrant has not been fully exercised and has not expired, a new warrant of like tenor representing the Shares not so acquired.

1.5 Replacement of Warrant. On receipt of evidence reasonably satisfactory to the Company of the loss, theft, destruction or mutilation of this Warrant and, in the case of loss, theft or destruction, on delivery of an indemnity agreement reasonably satisfactory in form, substance and amount to the Company or, in the case of mutilation, on surrender of this Warrant to the Company for cancellation, the Company shall, within a reasonable time, execute and deliver to Holder, in lieu of this Warrant, a new warrant of like tenor and amount.

1.6 Treatment of Warrant Upon Acquisition of Company.

(a) Acquisition. For the purpose of this Warrant, "**Acquisition**" means any transaction or series of related transactions involving: (i) the sale, lease, exclusive license, or other disposition of all or substantially all of the assets of the Company (ii) any merger or consolidation of the Company into or with another person or entity (other than a merger or consolidation effected exclusively to change the Company's domicile), or any other corporate reorganization, in which the shareholders of the Company in their capacity as such immediately prior to such merger, consolidation or reorganization, own less than a majority of the Company's (or the surviving or successor entity's) outstanding voting power immediately after such merger, consolidation or reorganization; or (iii) any sale or other transfer by the shareholders of the Company of shares representing at least a majority of the Company's then-total outstanding combined voting power.

(b) Treatment of Warrant at Acquisition. In the event of an Acquisition in which the consideration to be received by the Company's shareholders consists solely of cash,

solely of Marketable Securities or a combination of cash and Marketable Securities (a "**Cash/Public Acquisition**"), either (i) Holder shall exercise this Warrant pursuant to Section 1.1 and/or 1.2 and such exercise will be deemed effective immediately prior to and contingent upon the consummation of such Acquisition or (ii) if Holder elects not to exercise the Warrant, this Warrant will expire immediately prior to the consummation of such Acquisition.

(c) The Company shall provide Holder with written notice of its request relating to the Cash/Public Acquisition (together with such reasonable information as Holder may reasonably require regarding the treatment of this Warrant in connection with such contemplated Cash/Public Acquisition giving rise to such notice), which is to be delivered to Holder not less than seven (7) Business Days prior to the closing of the proposed Cash/Public Acquisition. In the event the Company does not provide such notice, then if, immediately prior to the Cash/Public Acquisition, the fair market value of one Share (or other security issuable upon the exercise hereof) as determined in accordance with Section 1.3 above would be greater than the Warrant Price in effect on such date, then this Warrant shall automatically be deemed on and as of such date to be exercised pursuant to Section 1.2 above as to all Shares (or such other securities) for which it shall not previously have been exercised, and the Company shall promptly notify the Holder of the number of Shares (or such other securities) issued upon such exercise to the Holder and Holder shall be deemed to have restated each of the representations and warranties in Section 4 of the Warrant as the date thereof.

(d) Upon the closing of any Acquisition other than a Cash/Public Acquisition defined above, the acquiring, surviving or successor entity shall assume the obligations of this Warrant, and this Warrant shall thereafter be exercisable for the same securities and/or other property as would have been paid for the Shares issuable upon exercise of the unexercised portion of this Warrant as if such Shares were outstanding on and as of the closing of such Acquisition, subject to further adjustment from time to time in accordance with the provisions of this Warrant.

(e) As used in this Warrant, "**Marketable Securities**" means securities meeting all of the following requirements: (i) the issuer thereof is then subject to the reporting requirements of Section 13 or Section 15(d) of the Securities Exchange Act of 1934, as amended (the "**Exchange Act**"), and is then current in its filing of all required reports and other information under the Act and the Exchange Act; (ii) the class and series of shares or other security of the issuer that would be received by Holder in connection with the Acquisition were Holder to exercise this Warrant on or prior to the closing thereof is then traded in Trading Market, and (iii) Holder would be able to publicly re-sell, within six (6) months following the closing of such Acquisition, all of the issuer's shares and/or other securities that would be received by Holder in such Acquisition were Holder to exercise this Warrant in full on or prior to the closing of such Acquisition.

SECTION 2. ADJUSTMENTS TO THE SHARES AND WARRANT PRICE.

2.1 Stock Dividends, Splits, Etc. If the Company declares or pays a dividend or distribution on the outstanding shares of the Class payable in common stock or other securities or property (other than cash), then upon exercise of this Warrant, for each Share acquired, Holder shall receive, without additional cost to Holder, the total number and kind of securities and property which Holder would have received had Holder owned the Shares of record as of the date the dividend or distribution occurred. If the Company subdivides the outstanding shares of the

Class by reclassification or otherwise into a greater number of shares, the number of Shares purchasable hereunder shall be proportionately increased and the Warrant Price shall be proportionately decreased. If the outstanding shares of the Class are combined or consolidated, by reclassification or otherwise, into a lesser number of shares, the Warrant Price shall be proportionately increased and the number of Shares shall be proportionately decreased.

2.2 Reclassification, Exchange, Combinations or Substitution. Upon any event whereby all of the outstanding shares of the Class are reclassified, exchanged, combined, substituted, or replaced for, into, with or by Company securities of a different class and/or series, then from and after the consummation of such event, this Warrant will be exercisable for the number, class and series of Company securities that Holder would have received had the Shares been outstanding on and as of the consummation of such event, and subject to further adjustment thereafter from time to time in accordance with the provisions of this Warrant. The provisions of this Section 2.2 shall similarly apply to successive reclassifications, exchanges, combinations substitutions, replacements or other similar events.

2.3 No Fractional Share. No fractional Share shall be issuable upon exercise of this Warrant and the number of Shares to be issued shall be rounded down to the nearest whole Share. If a fractional Share interest arises upon any exercise of the Warrant, the Company shall eliminate such fractional Share interest by paying Holder in cash the amount computed by multiplying the fractional interest by (i) the fair market value (as determined in accordance with Section 1.3 above) of a full Share, less (ii) the then-effective Warrant Price.

2.4 Notice/Certificate as to Adjustments. Upon each adjustment of the Warrant Price, Class and/or number of Shares, the Company, at the Company's expense, shall notify Holder in writing within a reasonable time setting forth the adjustments to the Warrant Price, Class and/or number of Shares and facts upon which such adjustment is based. The Company shall, upon written request from Holder, furnish Holder with a certificate of its Chief Financial Officer, including computations of such adjustment and the Warrant Price, Class and number of Shares in effect upon the date of such adjustment.

SECTION 3. REPRESENTATIONS AND COVENANTS OF THE COMPANY.

3.1 Representations and Warranties. The Company represents and warrants to, and agrees with, the Holder as follows:

(a) The initial Warrant Price referenced on the first page of this Warrant is not greater than the price per share at which shares of the Class were sold pursuant to the Company's Series C Preferred Stock Purchase Agreement, dated as of July 1, 2013.

(b) All Shares which may be issued upon the exercise of this Warrant shall, upon issuance pursuant to the terms hereof, be duly authorized, validly issued, fully paid and non-assessable, and free of any liens and encumbrances except for restrictions on transfer provided for herein, under applicable federal and state securities laws or created by the Holder. The Company covenants that it shall at all times cause to be reserved and kept available out of its authorized and unissued capital stock such number of shares of the Class, common stock and other securities as will be sufficient to permit the exercise in full of this Warrant and the conversion of the Shares into common stock or such other securities.

(c) Upon exercise of this Warrant pursuant to the terms hereof, the Holder shall be entitled to receive, with respect to the Shares, the registration rights set forth in that certain Third Amended and Restated Investors' Rights Agreement, dated as of April 3, 2014, by and among the Company and certain holders of the Company's capital stock (the "**IRA**").

3.2 Notice of Certain Events. If the Company proposes at any time to:

(a) declare any dividend or distribution upon the outstanding shares of the Class or common stock, whether in cash, property, stock, or other securities and whether or not a regular cash dividend;

(b) effect any reclassification, exchange, combination, substitution, reorganization or recapitalization of the outstanding shares of the Class;

(c) effect an Acquisition or to liquidate, dissolve or wind up; or

(d) effect an IPO;

then, in connection with each such event, the Company shall give Holder:

(1) in the case of the matters referred to in (a) above at least seven (7) Business Days prior written notice of the date on which a record will be taken for such dividend or distribution (and specifying the date on which the holders of outstanding shares of the Class will be entitled thereto) or for determining rights to vote, if any, in respect of the matters referred to in (a) above;

(2) in the case of the matters referred to in (b) and (c) above at least seven (7) Business Days prior written notice of the date when the same will take place (and specifying the date on which the holders of outstanding shares of the Class will be entitled to exchange their shares for the securities or other property deliverable upon the occurrence of such event); and

(3) with respect to the IPO, at least seven (7) Business Days prior written notice of the date on which the Company proposes to file its registration statement in connection therewith.

Reference is made to Section 1.6(c) whereby this Warrant will be deemed to be exercised pursuant to Section 1.2 hereof if the Company does not give written notice to Holder of a Cash/Public Acquisition as required by the terms hereof. Company will also provide information requested by Holder that is reasonably necessary to enable Holder to comply with Holder's accounting or reporting requirements.

SECTION 4. REPRESENTATIONS, WARRANTIES OF THE HOLDER.

The Holder represents and warrants to the Company as follows:

4.1 Purchase for Own Account. This Warrant and the securities to be acquired upon exercise of this Warrant by Holder are being acquired for investment for Holder's account, not as a nominee or agent, and not with a view to the public resale or distribution within the meaning of the Act. Holder also represents that it has not been formed for the specific purpose of acquiring this Warrant or the Shares.

4.2 Disclosure of Information. Holder is aware of the Company's business affairs and financial condition and has received or has had full access to all the information it considers necessary or appropriate to make an informed investment decision with respect to the acquisition of this Warrant and its underlying securities. Holder further has had an opportunity to ask questions and receive answers from the Company regarding the terms and conditions of the offering of this Warrant and its underlying securities and to obtain additional information (to the extent the Company possessed such information or could acquire it without unreasonable effort or expense) necessary to verify any information furnished to Holder or to which Holder has access.

4.3 Investment Experience. Holder understands that the purchase of this Warrant and its underlying securities involves substantial risk. Holder has experience as an investor in securities of companies in the development stage and acknowledges that Holder can bear the economic risk of such Holder's investment in this Warrant and its underlying securities and has such knowledge and experience in financial or business matters that Holder is capable of evaluating the merits and risks of its investment in this Warrant and its underlying securities and/or has a preexisting personal or business relationship with the Company and certain of its officers, directors or controlling persons of a nature and duration that enables Holder to be aware of the character, business acumen and financial circumstances of such persons.

4.4 Accredited Investor Status. Holder is an "accredited investor" within the meaning of Regulation D promulgated under the Act.

4.5 The Act. Holder understands that this Warrant and the Shares issuable upon exercise hereof have not been registered under the Act in reliance upon a specific exemption therefrom, which exemption depends upon, among other things, the bona fide nature of the Holder's investment intent as expressed herein. Holder understands that this Warrant and the Shares issued upon any exercise hereof must be held indefinitely unless subsequently registered under the Act and qualified under applicable state securities laws, or unless exemption from such registration and qualification are otherwise available. Holder is aware of the provisions of Rule 144 promulgated under the Act.

4.6 Market Stand-off Agreement. The Holder agrees that the Shares shall be subject to the Market Standoff provisions in Section 2.12 of the IRA.

4.7 No Voting Rights. Holder, as a Holder of this Warrant, will not have any voting rights until the exercise of this Warrant.

SECTION 5. MISCELLANEOUS.

5.1 Term and Automatic Conversion Upon Expiration.

(a) Term. Subject to the provisions of Section 1.6 above, this Warrant is exercisable in whole or in part at any time and from time to time on or before 6:00 PM, Pacific time, on the Expiration Date and shall be void thereafter.

(b) Automatic Cashless Exercise upon Expiration. In the event that, upon the Expiration Date, the fair market value of one Share (or other security issuable upon the exercise hereof) as determined in accordance with Section 1.3 above is greater than the Warrant Price in effect on such date, then this Warrant shall automatically be deemed on and as of such date to be exercised pursuant to Section 1.2 above as to all Shares (or such other securities) for which it shall not previously have been exercised, and the Company shall, within a reasonable time, deliver a certificate representing the Shares (or such other securities) issued upon such exercise to Holder.

5.2 Legends. The Shares (and the securities issuable, directly or indirectly, upon conversion of the Shares, if any) shall be imprinted with a legend in substantially the following form:

> THE SHARES EVIDENCED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "**ACT**"), OR THE SECURITIES LAWS OF ANY STATE AND, EXCEPT AS SET FORTH IN THAT CERTAIN WARRANT TO PURCHASE STOCK ISSUED BY THE ISSUER TO ALEXANDRIA EQUITIES, LLC DATED APRIL 21, 2014, MAY NOT BE OFFERED, SOLD, PLEDGED OR OTHERWISE TRANSFERRED UNLESS AND UNTIL REGISTERED UNDER SAID ACT AND LAWS OR IN FORM AND SUBSTANCE SATISFACTORY TO THE ISSUER, SUCH OFFER, SALE, PLEDGE OR OTHER TRANSFER IS EXEMPT FROM SUCH REGISTRATION.

5.3 Compliance with Securities Laws on Transfer. This Warrant and the Shares issuable upon exercise of this Warrant may not be transferred or assigned in whole or in part except in compliance with applicable federal and state securities laws by the transferor and the transferee (including, without limitation, the delivery of investment representation letters and legal opinions reasonably satisfactory to the Company, as reasonably requested by the Company). The Company shall not require Holder to provide an opinion of counsel if the transfer is to an affiliate of Holder, provided that any such transferee is an "accredited investor" as defined in Regulation D promulgated under ,the Act. Additionally, the Company shall also not require an opinion of counsel if there is no material question as to the availability of Rule 144 promulgated under the Act.

5.4 Transfer Procedure. Subject to the provisions of Section 5.3 and upon providing the Company with written notice, the Holder and any subsequent Holder may transfer all or part of this Warrant or the Shares issuable upon exercise of this Warrant to any transferee, provided, however, in connection with any such transfer, the Holder or any subsequent Holder will

give the Company notice of the portion of the Warrant being transferred with the name, address and taxpayer identification number of the transferee and Holder will surrender this Warrant to the Company for reissuance to the transferee(s) (and Holder if applicable); and provided further, that any subsequent transferee shall agree in writing with the Company to be bound by all of the terms and conditions of this Warrant. Notwithstanding any contrary provision herein, at all times prior to the IPO, Holder may not, without the Company's prior written consent, transfer this Warrant or any portion hereof, or any Shares issued upon any exercise hereof, to any person or entity who directly competes with the Company, except in connection with an Acquisition of the Company by such a direct competitor.

5.5 Notices. All notices and other communications hereunder from the Company to the Holder, or vice versa, shall be deemed delivered and effective (i) when given personally, (ii) on the third (3rd) Business Day after being mailed by first-class registered or certified mail, postage prepaid, (iii) upon actual receipt if given by facsimile or electronic mail and such receipt is confirmed in writing by the recipient, or (iv) on the first Business Day following delivery to a reliable overnight courier service, courier fee prepaid, in any case at such address as may have been furnished to the Company or Holder, as the case may be, in writing by the Company or such Holder from time to time in accordance with the provisions of this Section 5.5. All notices to Holder shall be addressed as follows until the Company receives notice of a change of address in connection with a transfer or otherwise:

Alexandria Equities, LLC
385 E. Colorado Blvd. Suite 299
Pasadena, CA 91101
Email.:

With a copy to:

Alexandria Equities, LLC
385 E. Colorado Blvd. Suite 299
Pasadena, CA 91101
Attn.:
Email:

Notice to the Company shall be addressed as follows until Holder receives notice of a change in address:

Adaptive Biotechnologies Corporation
Attn: Chad Robins
1551 Eastlake Avenue East, Suite 200
Seattle, WA 98102
Telephone:
Facsimile:
Email:

5.6 Waiver. This Warrant and any term hereof may be changed, waived, discharged or terminated (either generally or in a particular instance and either retroactively or prospectively) only by an instrument in writing signed by the party against which enforcement of such change, waiver, discharge or termination is sought.

5.7 Attorney's Fees. In the event of any dispute between the parties concerning the terms and provisions of this Warrant, the party prevailing in such dispute shall be entitled to collect from the other party all costs incurred in such dispute, including reasonable attorneys' fees.

5.8 Counterparts; Facsimile/Electronic Signatures. This Warrant may be executed in counterparts, all of which together shall constitute one and the same agreement. Any signature page delivered electronically or by facsimile shall be binding to the same extent as an original signature page with regards to any agreement subject to the terms hereof or any amendment thereto.

5.9 Governing Law. This Warrant shall be governed by and construed in accordance with the laws of the State of California, without giving effect to its principles regarding conflicts of law.

5.10 Headings. The headings in this Warrant are for purposes of reference only and shall not limit or otherwise affect the meaning of any provision of this Warrant.

5.11 Business Days. "**Business Day**" is any day that is not a Saturday, Sunday or a day on which banks are closed.

[Remainder of page left blank intentionally]
[Signature page follows]

IN WITNESS WHEREOF, the parties have caused this Warrant to Purchase Stock to be executed by their duly authorized representatives effective as of the Issue Date written above.

"COMPANY"

ADAPTIVE BIOTECHNOLOGIES CORPORATION

By: /s/ Chad Robins
Name: Chad Robins
(Print)
Title: CEO & President

"HOLDER"

ALEXANDRIA EQUITIES, LLC,
a Delaware limited liability company

By; Alexandria Real Estate Equities, Inc.,
a Maryland corporation, managing member

By: /s/ Jennifer Banks
Name: Jennifer Banks
Title: EVP, General Counsel

APPENDIX 1

NOTICE OF EXERCISE

1. The undersigned Holder hereby exercises its right purchase _____ shares of the Series C Preferred Stock of ADAPTIVE BIOTECHNOLOGIES CORPORATION (the "**Company**") in accordance with the attached Warrant To Purchase Stock, and tenders payment of the aggregate Warrant Price for such shares as follows:

☐ check in the amount of $____ payable to order of the Company enclosed herewith

☐ Wire transfer of immediately available funds to the Company's account

☐ Cashless Exercise pursuant to Section 1.2 of the Warrant

☐ Other [Describe] _____

2. Please issue a certificate or certificates representing the Shares in the name specified below:

_____

Holder's Name

_____

_____

(Address)

3. By its execution below and for the benefit of the Company, Holder hereby restates each of the representations and warranties in Section 4 of the Warrant to Purchase Stock as of the date hereof

HOLDER:

_____

By: _____
Name: _____
Title: _____
(Date): _____

Certain information has been excluded from this exhibit because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

CONFIDENTIAL **EXECUTION COPY**

STRATEGIC COLLABORATION AND LICENSE AGREEMENT

THIS STRATEGIC COLLABORATION AND LICENSE AGREEMENT ("**Agreement**") is made and entered into as of December 19, 2018 ("**Execution Date**"), by and between Adaptive Biotechnologies Corporation, a Washington corporation, having its principal place of business at 1551 Eastlake Ave E, Ste. 200 Seattle, Washington 98102 ("**Adaptive**") and Genentech, Inc., a Delaware corporation, having its principal place of business at 1 DNA Way, South San Francisco, California 94080 ("**GNE**"). GNE and Adaptive are sometimes referred to herein individually as a "**Party**" and collectively as the "**Parties**."

BACKGROUND

WHEREAS, Adaptive is a biotechnology company that is engaged in the discovery, identification and profiling of "**TCRs**" (defined below).

WHEREAS, GNE is a biopharmaceutical company that is engaged in the research, development, manufacture and sale of pharmaceutical products and therapies.

WHEREAS, the Parties desire to collaborate in the discovery, development, and commercialization of certain cellular therapy products using TCRs identified using Adaptive's proprietary platform for the treatment of cancer; and

WHEREAS, GNE desires to collaborate with Adaptive in the research and development of such TCRs and to obtain an exclusive license and other rights from Adaptive to develop and commercialize Licensed Products (defined below) for the treatment of cancer, and Adaptive agrees to engage in such collaborative efforts with GNE and to grant GNE certain licenses and other rights in exchange for certain agreed to upfront and other payments and other consideration, all as set forth herein.

NOW THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, GNE and Adaptive agree as follows:

ARTICLE 1
DEFINITIONS

Capitalized terms used in this Agreement, whether used in the singular or plural, shall have the meanings set forth below, unless otherwise specifically indicated herein.

1.1 "**Accounting Standard**" means, with respect to GNE, either: (a) International Financial Reporting Standards (IFRS); or (b) United States generally accepted accounting principles (GAAP), in either case, which standards or principles (as applicable) are currently used at the applicable time by, and as consistently applied by GNE.

1.2 "**Acquired Entity**" as defined in Section 8.1.6(c)(i).

1.3 "**Acquiring Affiliate**" as defined in Section 8.1.6(c)(ii).

1.4 "**Acquiring Affiliate Group**" as defined in Section 8.1.6(c)(iii).

1.5 "**Adaptive**" as defined in the Preamble.

1.6 "**Adaptive Core Patents**" as defined in Section 11.3.1.

1.7 "**Adaptive Core Platform IP**" as defined in Section 11.1.1.

1.8 "**Adaptive Platform**" means Adaptive's proprietary TruTCR discovery platform (including MIRA, immunoSEQ, pairSEQ, TCR profiling (including functional and safety profiling), TCR-Antigen mapping and correlation and associated informatics and proprietary algorithms), which is described further on the attached Exhibit 1.8, and all enhancements, modifications, improvements and updates thereto, including any enhancements, modifications, improvements and updates created after the Effective Date during the Term.

1.9 "**Adaptive Platform IP**" as defined in Section 11.1.1. [***].

1.10 "**Additional Reversion IP**" as defined in Section 16.6.2(b)(i).

1.11 "**Affiliate**" means any person that, directly or indirectly (through one or more intermediaries) controls, is controlled by, or is under common control with a Party. For purposes of this Section 1.11, "**control**" means: (a) the direct or indirect ownership of fifty percent (50%) or more of the voting stock or other voting interests or interest in the profits of the Party; or (b) the ability to otherwise control or direct the decisions of the board of directors or equivalent governing body thereof. Notwithstanding the foregoing, unless expressly specified otherwise, for the purposes of this Agreement, [***], shall not be considered an Affiliate of GNE unless and until GNE provides written notice to Adaptive specifying [***] as an Affiliate of GNE. Further notwithstanding anything to the contrary in this Section 1.11 or elsewhere in this Agreement, no licenses or rights are granted to Adaptive under any information, data, proprietary materials and/or other intellectual property rights whether or not patentable that are owned or controlled by [***]. Further notwithstanding anything to the contrary in this Section 1.11 or elsewhere in this Agreement, [***] shall not be considered an Affiliate of GNE, unless and until GNE so elects to include [***] as an Affiliate as provided in Section 8.5; it being understood, however that [***], shall be deemed an Affiliate of GNE.

1.12 "**Agreement**" as defined in the Preamble.

1.13 "**Alliance Manager**" as defined in Section 2.7.

1.14 "**Antigen**" means a peptide or protein (or any fragment or epitope thereof) against which the immune system may produce an adaptive immune response.

1.15 "**Approved Development Subcontractors**" as defined in Section 4.3.

1.16 "**Approved Subcontractors**" as defined in Section 3.4.

1.17 "**Biosimilar**" as defined in Section 9.4.5.

1.18 "**Cell Therapy**" means the administration of living cells to a patient for the treatment of a disease or condition, which cells' origin can, for example, be from the same individual (autologous source) or from another individual (allogeneic source).

1.19 "**Change of Control**" means, with respect to a Party: (a) that any Third Party acquires directly or indirectly the beneficial ownership of any voting securities of such Party, or if the percentage ownership of such Party in the voting securities of such Party is increased through stock redemption, cancellation or other recapitalization, and immediately after such acquisition or increase such Third Party is, directly or indirectly, the beneficial owner of outstanding voting securities representing more than fifty percent (50%) of the total voting power of all of the then outstanding voting securities of such Party; (b) a merger (whether by contract, by statute or by operation of law), consolidation, recapitalization or reorganization of such Party is consummated, other than any such transaction in which stockholders or equity holders of such Party immediately prior to such transaction beneficially own, directly or indirectly, at least fifty percent (50%) of the voting securities of the surviving entity (or its parent entity) immediately following such transaction; (c) that the stockholders or equity holders of such Party approve a plan of complete liquidation of such Party; or (d) the sale or disposition to a Third Party of all or substantially all of such Party's assets taken as a whole. For purposes of this definition, "beneficial ownership" shall have the meaning accorded in the U.S. Securities Exchange Act of 1934 and the rules of the U.S. SEC under this Agreement in effect as of the Execution Date. Notwithstanding the foregoing, (i) a transaction solely to change the domicile of a Party; (ii) the consummation of an initial public offering; or (iii) any merger or consolidation between a Party and one or more Affiliates shall not constitute a Change of Control.

1.20 "[***]" as defined in Section 1.11.

1.21 "[***]" as defined in Section 8.4.1.

1.22 "[***]" as defined in Section 8.4.2.

1.23 "**Clinical Trial**" means a phase I clinical trial, phase II clinical trial (including for avoidance of any doubt a phase Ib or phase IIb clinical trial) or Pivotal Clinical Trial or any other equivalent, combined or other trial in which any Licensed Product is administered to a human subject.

1.24 "**Collaboration Data**" means, collectively, all: (a) Know-How contained in any Shared Antigen Data Packages; (b) Private Antigen TCR Product Data; and (c) any data reflecting modifications or derivatives of any TCR Sequences contained in the Shared Antigen Data Packages or Private Antigen TCR Product Data created or developed by or on behalf of either Party under the Research Program or under the Development Program, as applicable.

1.25 "**Collaboration Field**" means Cell Therapy in oncology.

1.26 "**Combination**" as defined in Section 1.92.

1.27 "**Commercialization**" means marketing, promoting, detailing, distributing, importing, exporting, offering for sale or selling a product, including medical affairs activities, regulatory

activities directed to obtaining pricing and reimbursement approvals, price calculations and related reporting to governmental authorities, and interacting with Regulatory Authorities with respect to the foregoing. For clarity, as used in this Agreement, "Commercialization" includes manufacturing a product. When used as a verb, "**Commercialize**" means to engage in Commercialization activities.

1.28 "**Commercially Reasonable Efforts**" means those efforts ([***]), and the application and expenditure of such resources, applied and expended in a manner consistent with the exercise of prudent scientific and business judgment and business practices, as are customary for [***].

1.29 "**Committees**" as defined in Section 2.1.1.

1.30 "**Companion Diagnostic**" means any product that is developed for use with or otherwise in connection with a Licensed Product and that:

(a) identifies a person having a disease or condition, or a molecular genotype or phenotype that predisposes a person to such disease or condition, for which a Licensed Product could be used to treat and/or prevent such disease or condition;

(b) defines the prognosis or monitors the progress of a disease or condition in a person for which a Licensed Product could be used to treat and/or prevent such disease or condition;

(c) is used to select a therapeutic or prophylactic regimen, wherein at least one (1) potential therapeutic or prophylactic regimen involves a Licensed Product; and/or

(d) is used to confirm a Licensed Product's biological activity and/or to optimize dosing or the scheduled administration of a Licensed Product.

1.31 "**Compulsory Sublicense**" means a sublicense granted to a Third Party of the rights granted to GNE under ARTICLE 6, through the order, decree or grant of a governmental authority having competent jurisdiction in a given country, authorizing such Third Party to manufacture, use, sale, offer for sale, import or export a Licensed Product in such country in the Territory [***].

1.32 "**Compulsory Sublicensee**" means a Third Party that was granted a Compulsory Sublicense.

1.33 "**Confidential Information**" means proprietary Know-How (of whatever kind and in whatever form or medium, including copies thereof), tangible materials or other deliverables: (a) disclosed by or on behalf of a Party in connection with this Agreement, whether prior to or during the Term and whether disclosed orally, electronically, by observation or in writing; or (b) created by, or on behalf of, either Party and provided to the other Party, or created jointly by the Parties, in the course of this Agreement. For the avoidance of doubt, "Confidential Information" includes: (i) Know-How regarding such Party's research, development plans, Clinical Trial designs, preclinical and clinical data, technology, products, business information or objectives and other information of the type that is customarily considered to be confidential information by entities engaged in activities that are substantially similar to the activities being engaged in by the Parties pursuant to this Agreement; and (ii) any tangible materials or other deliverables provided by one Party to the other Party pursuant to ARTICLE 12.

1.34 "**Content**" as defined in Section 13.3.2.

1.35 "**Control**" or "**Controlled by**" means the rightful possession by a Party, as of the Effective Date or throughout the Term, of the ability to grant a license, sublicense or other right to exploit, as provided herein, without violating the terms of any agreement with any Third Party.

1.36 "**Covers**" (including variations such as "**Covered**", "**Covering**" and the like), means, with respect to a particular Patent in a particular country and in reference to a particular product (whether alone or in combination with one or more other ingredients) that the manufacture, use, sale, offer for sale or importation of such compound or product in a country is claimed by a Valid Claim of such Patent in that country.

1.37 "**Controlling Affiliate Program**" as defined in Section 8.1.6(c)(iv).

1.38 "**CPA Firm**" as defined in Section 10.7.2.

1.39 "**Create Act**" as defined in Section 11.2.4.

1.40 "**Deliverables**" as defined in Section 7.1.

1.41 "**Development**" or "**Develop**" means for a given product, any activity directed to obtaining or expanding Marketing Approval, including all preclinical and clinical drug or biologic product development activities, including: the conduct of Clinical Trials, cell line development, master cell bank generation, test method development and stability testing, toxicology, formulation and delivery system development, process development, pre-clinical and clinical supply, manufacturing scale-up, development-stage manufacturing, quality assurance/quality control procedure development and performance with respect to clinical materials, statistical analysis and report writing and clinical studies, regulatory affairs with respect to the foregoing. Development shall include, with respect to the Licensed Products, all activities conducted under a Development Plan. When used as a verb, "**Develop**" means to engage in Development.

1.42 "**Development Plan**" as defined in Section 4.2.

1.43 "**Development Plan Overview**" as defined in Section 4.2.

1.44 "**Development Program**" means the activities conducted by the Parties in connection with the Development of Licensed Products pursuant to ARTICLE 4, including under the Development Plan.

1.45 "**Disclosing Party**" as defined in Section 13.6(b).

1.46 "**Dispute**" as defined in Section 18.1.

1.47 "**Effective Date**" means the first (1st) business day immediately following the date on which the Parties have actual knowledge that all applicable waiting periods under the HSR Act with respect to the transactions contemplated under this Agreement have expired or have been terminated. Upon the request of either Party, the Parties shall memorialize the Effective Date, as defined in the immediately preceding sentence, in a written document for the record.

1.48 "**Enforcement**" as defined in Section 11.4.3.

1.49 "**EU**" means the member states of the European Union (including for clarity the United Kingdom even if, at the relevant time, the United Kingdom (or any part thereof) is not a member state of the European Union), or any successor entity thereto performing similar functions.

1.50 "**Excluded Expanded Use TCR**" as defined in Section 8.1.4.

1.51 "**Execution Date**" as defined in the Preamble.

1.52 "**Executives**" as defined in Section 2.9.

1.53 "**Existing Adaptive TCRs**" as defined in Section 3.3.

1.54 "**Expanded Therapeutic Field**" means all therapeutic uses in humans, excluding any use for: (a) diagnostic purposes (other than Companion Diagnostics); and (b) immune monitoring or (c) or services provided for immunological research.

1.55 "**Expanded Use TCR**" as defined in Section 8.1.4.

1.56 "**FDA**" means the United States Food and Drug Administration, or any successor entity thereto performing similar functions.

1.57 "**Field**" means (a) with respect to all Licensed Products, the treatment of any oncology Indication and (b) with respect to each Shared Antigen TCR Product or Private Antigen TCR Product which achieves First Commercial Sale of such product in the US, Japan or in a Major European Market for an oncology Indication, the Expanded Therapeutic Field from and after such First Commercial Sale; and (c) on a Shared Antigen TCR-by-Shared Antigen TCR basis or Private Antigen TCR-by-Private Antigen TCR basis, following the First Commercial Sale of any Shared Antigen TCR Product or Private Antigen TCR Product expressing such Shared Antigen TCR or Private Antigen TCR in the US, Japan or in a Major European Market for an oncology Indication, the Expanded Therapeutic Field.

1.58 "**First Commercial Sale**" means, with respect to a particular Licensed Product in a given country, the first bona fide commercial sale to a Third Party of such Licensed Product following Marketing Approval in such country by or under authority of the GNE Group. For clarity, if a Licensed Product achieves Marketing Approval in a second or third Indication in a given country (following achievement of a First Commercial Sale for any initial Indication in such country), the "First Commercial Sale" for such Licensed Product in such second or third Indication in such country (but not with respect to any other country) will be deemed to be achieved at the time of Marketing Approval for such second or third Indication in such country (including for the purposes of [***]). Sales or other dispositions under Compulsory Sublicenses, for Clinical Trial or other scientific testing purposes, as free samples, under named patient use, patient assistance, charitable purposes, early access or compassionate use programs, or similar uses, programs, or studies, shall not constitute a First Commercial Sale.

1.59 "**Global Function**" as defined in Section 8.4.3.

1.60 "**GNE**" as defined in the Preamble.

1.61 "**GNE Collaboration IP**" as defined in Section 11.1.2.

1.62 "**GNE Group**" as defined in Section 1.92.

1.63 "**GNE Other TCR Cell Therapy Program**" as defined in Section 8.2.1.

1.64 "**GNE TCR Technology**" as defined in Section 16.6.2(a)(i).

1.65 "**Good Laboratory Practices**" or "**cGLP**" means all applicable current standards for laboratory activities for pharmaceuticals, as set forth in the FDA's Good Laboratory Practice regulations as defined in 21 C.F.R. Part 58 and/or the Good Laboratory Practice principles of the Organization for Economic Co-Operation and Development, and such standards of good laboratory practice as are required by the EU and other organizations and governmental agencies in countries in which a Licensed Product is intended to be sold, to the extent such standards are not less stringent than US Good Laboratory Practice.

1.66 "**Governmental Required Consents**" means, with respect to a Party, compliance by such Party with, and filings by such Party under, the HSR Act.

1.67 "**HSR Act**" means the Hart-Scott-Rodino Antitrust Improvements Act of 1976, as amended from time to time, and any comparable applicable law in jurisdictions outside the US related to the approval of transactions similar to those contemplated under this Agreement.

1.68 "**HSR Clearance Date**" means the expiration or termination of all applicable waiting periods and requests for information (and any extensions thereof) under the HSR Act.

1.69 "**HSR Filing**" means: (a) filings by the Parties with the U.S. Federal Trade Commission and the Antitrust Division of the U.S. Department of Justice of a Notification and Report Form for Certain Mergers and Acquisitions (as that term is defined in the HSR Act) with respect to the matters set forth in this Agreement, together with all required documentary attachments thereto; or (b) equivalent filings with relevant foreign authorities.

1.70 "**IND**" means an investigational new drug application filed with the FDA pursuant to 21 CFR Part 312 before the commencement of Clinical Trials, or any comparable filing with any relevant regulatory authority in any other jurisdiction.

1.71 "**IND Acceptance**" means an IND that has been accepted by a Regulatory Authority.

1.72 "**Indemnitee**" defined in Section 15.2.

1.73 "**Indemnitor**" defined in Section 15.2.

1.74 "**Indication**" means the intended use of a Licensed Product for either therapeutic treatment or for the prevention of a distinct illness, sickness, interruption, cessation or disorder of a particular bodily function, system, tissue type or organ, or sign or symptom of any such items or conditions, regardless of the severity, frequency or route of any treatment, treatment regimen, dosage strength or patient class, for which any Marketing Approval is being sought and which will be referenced on any Licensed Product labelling in any country. [***].

1.75 "**Infringement**" as defined in Section 11.4.1.

1.76 "**Intellectual Property**" means Patents and Know-How.

1.77 "**Investor Information**" as defined in Section 13.3.1.

1.78 "**Investor Presentation(s)**" as defined in Section 13.3.1.

1.79 "**IPR**" as defined in Section 11.1.3.

1.80 "**IPWG**" as defined in Section 2.1.4.

1.81 "**JDC**" as defined in Section 2.1.1.

1.82 "**JPT**" as defined in Section 2.1.4.

1.83 "**JRC**" as defined in Section 2.1.1.

1.84 "**Know-How**" means all information, inventions (whether or not patentable), improvements, practices, formula, trade secrets, techniques, methods, procedures, knowledge, results, test data (including pharmacological, toxicological, pharmacokinetic and pre-clinical and clinical information and test data, related reports, structure-activity relationship data and statistical analysis), analytical and quality control data, protocols, processes, models, designs, TCR sequence information, and other information regarding discovery, Development, marketing, pricing, distribution, cost, sales and manufacturing. Know-How shall not include any Patents.

1.85 "**Licensed Product**" means: (a) a Shared Antigen TCR Product or a Private Antigen TCR Product, individually or collectively as the context may require; and (b) following [***], any biopharmaceutical composition(s), preparation(s) or formulation(s) that contains any Shared Antigen TCR or Private Antigen TCR expressed in the applicable Shared Antigen TCR Product or Private Antigen TCR Product for which such First Commercial Sale in an oncology Indication occurred.

1.86 "**Loss**" or "**Losses**" as defined in Section 15.1.

1.87 "**Major European Market**" means France, Germany, Spain, Italy or the United Kingdom.

1.88 "**Marketing Approval**" means all approvals, licenses, registrations or authorizations of any federal, state or local regulatory agency, department, bureau or other governmental entity, necessary for the manufacturing, use, storage, import, transport and sale of Licensed Products in a country or regulatory jurisdiction. For countries where governmental approval is required for pricing or reimbursement for the Licensed Product, "Marketing Approval" shall not be deemed to occur until such pricing or reimbursement approval is obtained.

1.89 "**Marketing Approval Application**" means BLA, sBLA, NDA, sNDA and any equivalent thereof in the United States or any other country or jurisdiction in the Territory. As used herein: "**BLA**" means a Biologics License Application and amendments thereto filed pursuant to the requirements of the FDA, as defined in 21 C.F.R. § 600 et seq., for FDA approval of a Licensed Product and "**sBLA**" means a supplemental BLA; and "**NDA**" means a New Drug Application and amendments thereto filed pursuant to the requirements of the FDA, as defined in 21 C.F.R. § 314 et seq., for FDA approval of a Licensed Product and "**sNDA**" means a supplemental NDA.

1.90 "**Materials**" as defined in Section 7.1.

1.91 "**Neoantigen**" means a mutated human Antigen arising in a tumor cell.

1.92 "**Net Sales**" means with respect to a Licensed Product the sum of:

(a) in the case of sales of such Licensed Product by GNE and its Affiliates (the "**GNE Group**"), an amount calculated by subtracting from the amount of Sales of such Licensed Product: (i) a lump sum deduction of [***] percent ([***]%) of Sales in lieu of those deductions which are not accounted for within the GNE Group on a Licensed Product-by-Licensed Product basis (*e.g.*, freight, postage charges, transportation insurance, packing materials for dispatch of goods, custom duties); (ii) uncollectible amounts on previously sold Licensed Product and credit card charges (including processing fees) that are applicable to such Licensed Product that not already taken as a gross-to-net deduction, if allowed, in accordance with the then currently used Accounting Standard in the calculation of Sales of such Licensed Product; and (iii) an allocation of any government mandated fees, taxes and other charges not already taken as a gross-to-net deduction, if allowed, in accordance with the then currently used Accounting Standard in the calculation of Sales of such Licensed Product, including, for example, any fees, taxes or other charges that become due in connection with any healthcare reform, change in government pricing or discounting schemes, or other action of a government or regulatory body.

(b) in the case of sales of such Licensed Product by any sublicensee (other than a GNE Affiliate, and subject to clause (c) below in respect of Compulsory Sublicensees), the "net sales" of such Licensed Product by such sublicensee, as such term is defined in the applicable agreement with such sublicensee, or, if such agreement does not use the term "net sales," the equivalent term used in such agreement that represents gross sales or gross invoiced amounts (as applicable), less expressly permitted deductions under such agreement, which such permitted deductions shall be in line with standard deductions in the industry and in accordance with applicable Accounting Standards.

(c) in the case of sales of such Licensed Product by any Compulsory Sublicensee, Net Sales means the gross royalty and other cash consideration paid to GNE or its Affiliate in consideration for such sublicense of such Licensed Product. For clarity, the [***] percent ([***]%) taken in clause (a) shall not apply to any amounts so received from any such Compulsory Sublicensee.

As used in this Section:

(i) **Sales among Affiliates and Sublicensees**. Sales between or among a Party, its Affiliates and/or their respective sublicensees shall be excluded from the computation of Net Sales, but Net Sales shall include the first Sale to a Third Party by any such Affiliates or sublicensees.

(ii) **Supply as Samples/Test Materials**. Notwithstanding anything to the contrary in the definition of Net Sales, the supply or other disposition Licensed Products: (i) as samples; (ii) for use in non-clinical or clinical studies; (iii) for use in any tests or studies reasonably necessary to comply with any applicable law, regulation or request by a regulatory or governmental authority; in each case ((i) through (iii)) as is reasonable and customary in the industry, shall not be included in the computation of Net Sales.

(iii) **Licensed Products Sold in Combinations**.

(A) In the event that a Licensed Product is sold in combination (in the same package, including as a co-formulation) with one or more other active ingredients, other than any Third Party TCR, which is addressed in Section 8.3, that are not the subject of this Agreement (for purposes of this Section 1.92, a "**Combination**"), the gross amount invoiced for such Licensed Product shall be calculated by [***].

(B) In the event that such other active ingredient(s) are not sold separately (but such Licensed Product is), the gross amount invoiced for such Licensed Product shall be calculated by multiplying the gross amount invoiced for such Combination by the fraction A/C, where "A" is the gross invoice amount for such Licensed Product, and "C" is the gross invoice amount for the Combination.

(C) In the event that such Licensed Product is not sold separately, the Net Sales for royalty calculations shall be determined by GNE in its reasonable discretion in accordance with its applicable Accounting Standard consistently applied.

(D) A Licensed Product which is sold as part of a combination therapy to be administered to a patient in connection with the administration of another active agent not subject to this Agreement (*e.g.*, a Licensed Product labelled for use in conjunction with a PD-1 inhibitor compound) shall not be deemed a Combination hereunder unless such Licensed Product and such other active agent are sold together for a single price. In addition, the administration to a patient of a Shared Antigen TCR Product as well as a Private Antigen TCR Product shall not be considered a Combination and instead Net Sales with respect thereto shall be calculated on each of such Shared Antigen TCR Product and Private Antigen TCR Product, to the extent each is sold separately, or shall be calculated based on the total price of the combined offering of such Shared Antigen TCR Product and Private Antigen TCR Product, if sold together for a single price.

1.93 "**Net Sales Report**" as defined in Section 10.2.

1.94 "**Non-Disclosing Party**" as defined in Section 13.6(b).

1.95 "**Non-Disclosure Agreement**" as defined in Section 12.6.

1.96 "**Opposition Proceeding**" as defined in Section 11.4.2.

1.97 "**Other TCR Cell Therapy**" means: (a) in the case of Adaptive, a Cell Therapy engineered to express a TCR which: [***]; and (b) in the case of GNE, a Cell Therapy engineered to express a TCR which: [***].

1.98 "**Outside TCR Product**" as defined in Section 8.2.1(c).

1.99 "**Party**" or "**Parties**" as defined in the Preamble.

1.100 "**Patent(s)**" means any and all patents and patent applications and any patents issuing therefrom or claiming priority to, worldwide, together with any extensions (including patent term extensions and supplementary protection certificates) and renewals thereof, reissues, reexaminations, substitutions, confirmation patents, registration patents, invention certificates, patents of addition, renewals, divisionals, continuations, and continuations-in-part of any of the foregoing.

1.101 "**Patient Sample**" means tissue, fluid, or cells collected from a patient, or components of the foregoing.

1.102 "**Permitted Third Party TCR Agreement**" as defined in Section 8.1.1.

1.103 "**Pivotal Clinical Trial**" means either (a) a human clinical trial, the principal purpose of which is to demonstrate clinically and statistically the efficacy and safety of a Licensed Product for one or more Indications in order to obtain Marketing Approval of such Licensed Product for such Indication(s), as further defined in 21 C.F.R. §312.21 or (b) a human clinical trial of a product on a sufficient number of subjects that, prior to commencement of the trial, satisfies both of the following ((i) and (ii)): (i) such trial is designed to establish that a Licensed Product has an acceptable safety and efficacy profile for its intended use, and to determine warnings, precautions, and adverse reactions that are associated with such Licensed Product in the dosage range to be prescribed, which trial is intended to support Marketing Approval of such product; and (ii) such trial is a registration trial sufficient to support the filing of Marketing Approval Application for such Licensed Product in the U.S., Japan, or a Major European Market, as evidenced by (A) an agreement with or statement from the FDA or the EMA on a 'Special Protocol Assessment' or equivalent, or (B) other guidance or minutes issued by the FDA or EMA, for such registration trial.

1.104 "[***] **Organization**" as defined in Section 8.4.4.

1.105 "[***] **TCR**" as defined in Section 8.4.5.

1.106 "[***] **TCR Program**" as defined in Section 8.4.6.

1.107 "**Prioritized TCR**" as defined in Section 3.3.

1.108 "**Private Antigen**" means any Antigen arising in a tumor cell that is identified by means of a de novo analysis of an individual Patient Sample from an oncology patient provided by or on behalf of GNE. [***].

1.109 "**Private Antigen TCR**" means a TCR that is identified using the Adaptive Platform, and any modifications or derivatives of such TCR, and is directed to a Private Antigen.

1.110 "**Private Antigen TCR Product**" means a Cell Therapy engineered to express at least one Private Antigen TCR. A Private Antigen TCR Product may also contain Shared Antigen TCRs in combination with at least one Private Antigen TCR.

1.111 "**Private Antigen TCR Product Data**" means all Know-How generated by or on behalf of Adaptive either: (a) under the TCR Sequencing Plan; or (b) arising from its performance under the TCR Sequence Supply Agreement, in each case of (a) or (b), in connection with Patient Samples from oncology patients provided by or on behalf of GNE.

1.112 "**Private Royalty Term**" as defined in Section 9.4.7(b).

1.113 "**Project Co-Leader**" as defined in Section 2.2.1.

1.114 **"Proposed Agreement**" as defined in Section 16.6.3(d).

1.115 "**Prosecution and Maintenance**" or "**Prosecute and Maintain**" as defined in Section 11.1.3.

1.116 "**Public Disclosure**" as defined in Section 13.3.1.

1.117 "**Recurring Private Antigen**" means a Private Antigen against which is directed a Private Antigen TCR that was contained in a Private Antigen TCR Product and that: (a) is identified as recurring and inducing an immune response on a sufficiently frequent basis in the patient population; (b) [***]; and (c) [***].

1.118 "**Regulatory Authority**" means the FDA (or any successor agency) or any equivalent agency thereof in jurisdictions outside of the US.

1.119 "**Regulatory Materials**" means any regulatory application, submission, notification, communication, correspondence, registration and other filings made to, received from or otherwise conducted with a Regulatory Authority in order to research, Develop, or Commercialize a TCR or Licensed Product in a particular country or jurisdiction. "Regulatory Materials" includes any Marketing Approval or Marketing Approval Application.

1.120 "**Release**" as defined in Section 13.1.

1.121 "**Requesting Party**" as defined in Section 13.3.2.

1.122 "**Required Filing(s)**" as defined in Section 13.3.1.

1.123 "**Research Plan**" as defined in Section 3.2.

1.124 "**Research Program**" means the activities relating to the identification and initial development of potential Licensed Products conducted by the Parties pursuant to ARTICLE 3, including those under the Research Plan.

1.125 "**Reversion TCR**" as defined in Section 16.6.2(a)(i).

1.126 "**Reversion TCR License**" as defined in Section 16.6.2(a)(iii).

1.127 "**Reviewing Party**" as defined in Section 13.3.2.

1.128 "[***]" as defined in Section 8.4.7.

1.129 "[***]" as defined in Section 8.4.8.

1.130 "**Rules**" as defined in Section 18.2.1.

1.131 "**Sales**" of a Licensed Product by any member of the GNE Group means, for any period, the amount stated in GNE's or the GNE Group's, as the case may be, "Sales" line of its externally published audited financial statements with respect to such Licensed Product for such period, which amount reflects the gross invoice price of such Licensed Product sold or otherwise disposed of (other than as may be excepted as set forth in the definition of Net Sales) by the GNE Group, reduced by gross-to-net deductions (to the extent applied consistently by the GNE Group with respect to sales of their respective other products; *provided* that such amount meets the definition of "sales" under applicable Accounting Standards) if not previously deducted from the amount invoiced, taken in accordance with the then currently used Accounting Standard. By way of example, the gross-to-net deductions taken in accordance with the applicable Accounting Standard as of the Effective Date are the following:

(a) credits, reserves or allowances granted for: (i) damaged, outdated, returned, rejected, withdrawn or recalled Licensed Product, wastage replacement, and short-shipments; (ii) billing errors; and (iii) indigent patient and similar programs (*e.g.*, price capitation);

(b) governmental price reductions and government mandated rebates;

(c) chargebacks, including those granted to wholesalers, buying groups and retailers;

(d) customer rebates including cash sales incentives for prompt payment, cash and volume discounts; and

(e) taxes, duties and any other governmental charges or levies imposed upon or measured by the import, export, use, manufacture or sale of a Licensed Product, but only to the extent not included in the invoice for such Licensed Product. Income or franchise taxes are excluded.

1.132 "**Screening Contract Manufacturer**" as defined in Exhibit 7.4.

1.133 "**Screening Technology**" as defined in Exhibit 7.4.

1.134 "**Screening Technology Transfer**" as defined in Exhibit 7.4.

1.135 "**Screening Technology Transfer Agreement**" as defined in Exhibit 7.4.

1.136 "**Shared Antigen Data Package**" as defined in Section 3.3.

1.137 "**Shared Antigen TCR**" means a TCR identified through the use of the Adaptive Platform (and any modifications or derivatives of such TCR) that, in each case, is directed to: (a) a Shared Neoantigen; or (b) a Tumor Associated Antigen.

1.138 "**Shared Antigen TCR Product**" means a Cell Therapy engineered to express [***] Shared Antigen TCR. A Shared Antigen TCR Product may also contain a combination of Shared Antigen TCRs directed to Shared Neoantigens, Recurring Private Antigens and/or Tumor Associated Antigens.

1.139 "**Shared Library**" means the library of TCR Sequences and their relationship to given Shared Neoantigens and/or Tumor Associated Antigens, which library consists of all Prioritized TCRs identified through the process described in Section 3.3. For clarity, the Shared Library may also include Prioritized TCRs identified through the process described in Section 3.3 that were originally identified as being directed to Recurring Private Antigens.

1.140 "**Shared Neoantigen**" means any Neoantigen that has been identified as recurrent across a patient population.

1.141 "**Shared Product Antigen Target**" as defined in Section 3.3.

1.142 "**Shared Royalty Term**" as defined in Section 9.4.7(a).

1.143 "**T-Cell**" means any of the lymphocytes that are derived from the human thymus and have the ability to recognize specific Antigens.

1.144 "**Target Turnaround Objective**" means in connection with the Private Antigen TCR Products, the completion by Adaptive of the processes described in Parts 2, 3, 4.1 and 4.2 (but not Part 4.3) of the TCR Sequencing Plan Requirements, as set forth in Exhibit 2.2.2(d), within the relevant Target Turnaround Time. [***].

1.145 "**Target Turnaround Time**" mean, with respect to the Private Antigen Product, and on a patient-by-patient basis, a time period of [***], commencing on the date that Adaptive receives from GNE the relevant list of tumor mutations from such patient (and related tumor (or gDNA extracted from tumor tissue) sample if GNE notifies Adaptive in writing that it is electing to complete the activities set out in Part 1.2 of Exhibit 2.2.2(d)).

1.146 "**TCR**" means a T-Cell receptor which is a heterodimer expressed on the membrane of a T-Cell that can recognize Antigen epitopes.

1.147 "**TCR Sequence Supply Agreements**" as defined in Section 7.3.4.

1.148 "**TCR Sequences**" as defined in Section 5.2.

1.149 "**TCR Sequencing Plan**" as defined in Section 2.2.2(d).

1.150 "**TCR Sequencing Plan Requirements**" as defined in Section 2.2.2(d).

1.151 "**TCR-Specific Platform IP**" as defined in Section 11.1.1.

1.152 "**Term**" as defined in Section 16.1.

1.153 "**Territory**" means all the countries of the world.

1.154 "**Third Party**" means any entity other than Adaptive or GNE or an Affiliate of either.

1.155 "**Third Party Claims**" as defined in Section 15.1.

1.156 "**Third Party Infringement Claim**" as defined in Section 11.5.1.

1.157 "**Third Party TCR**" as defined in Section 8.3.

1.158 "**Title 11**" as defined in Section 16.3.

1.159 "**TruTCR Criteria**" means the criteria set forth in Exhibit 1.159, and any improvements thereto made pursuant to the Research Plan that the Parties mutually agree to include in such criteria (which agreement shall not be subject to GNE's final decision making authority hereunder).

1.160 "**Tumor Associated Antigen**" means either (a) a wild-type human Antigen that is over-expressed or selectively expressed in a human tumor cell or (b) an Antigen arising from non-human proteins such as viral sequences that is expressed in a human tumor cell, in each case of (a) or (b), that is not a Neoantigen.

1.161 "**US**" means the United States of America and its territories and possessions.

1.162 "**Valid Claim**" means, with respect to a particular country, a claim contained in a TCR-Specific Platform IP Patent or a GNE Collaboration IP Patent, in each instance that is directed to the [***], of a TCR, including [***], and that is in either: (a) an issued and unexpired Patent in such country that has not been disclaimed, revoked, held unenforceable, unpatentable or invalid by a decision of a court or other governmental agency of competent jurisdiction, unappealable or unappealed within the time allowed for appeal, and that has not been admitted to be invalid or unenforceable through re-examination, re-issue, disclaimer or otherwise, or lost in an interference proceeding; or (b) a patent application in such country that has not been revoked, cancelled, withdrawn, held invalid, patentable, or finally abandoned and that has not been pending for more than [***] from the date of its earliest priority date.

1.163 "**VAT**" means, in the EU, value added tax calculated in accordance with Council Directive 2006/112/EC and, in a jurisdiction outside the EU, any equivalent tax.

1.164 "**Working Group(s)**" as defined in Section 2.1.4.

ARTICLE 2
GOVERNANCE

2.1 **Joint Research and Development Committees**.

2.1.1 **Formation and Composition**. As soon as reasonably practicable, Adaptive and GNE shall establish: (a) a joint research committee (the "**JRC**") to monitor and coordinate the activities under the Research Program, which the Parties shall form, in any event, within [***] days after the Effective Date; and (b) a joint development committee (the "**JDC**") to monitor and coordinate the activities under the Development Program; ((a) and (b), collectively, the "**Committees**"). The Committees shall each be composed of at least [***] but no more than [***] representatives designated by each Party (and [***] number of representatives). Representatives must be appropriate for the tasks then being undertaken and the stage of research or Development, in terms of their seniority, availability, function in their respective organizations, training and experience. Each Party shall designate one of its representatives as its primary JRC or JDC contact on the respective Committee. Each Party may replace its representatives from time to time by informing the other Party in writing (which may be by email); *provided*, that if a Party's representative is unable to attend a meeting, such Party may designate an alternate to attend such meeting by informing the other Party's representatives in writing (which may be by email) in advance and following submission of such written notification the alternate will be entitled to perform the functions of such representative. The Alliance Managers may attend meetings of the Committees but shall have no right to vote on any decisions of a Committee.

2.1.2 **JRC Responsibilities**. In addition to its overall responsibility for overseeing the Research Programs, the JRC shall, in particular:

(a) work with the Project Co-Leaders to coordinate all material research activities performed by each Party and monitor progress of the research activities of the Parties hereunder, including the review and discussion of progress reports delivered under Section 3.5.1;

(b) review and approve amendments to the Research Plan as proposed by the JPT;

(c) review and discuss the Shared Antigen Data Package delivered by Adaptive and the Know-How therein;

(d) review and discuss the Private Antigen TCR Product Data and data related to Recurring Private Antigens;

(e) review and approve the allocation of resources and efforts for the Research Program;

(f) determine the specific format and timeline for the transfer of any Deliverables in respect of the Research Program, as set forth in Section 7.1;

(g) discuss any potential Permitted Third Party TCR Agreements related to the Research Program under this Agreement, as appropriate, as set forth in Section 8.1;

(h) subject to ARTICLE 13, review and approve the research communication and publication strategy as developed by the JPT;

(i) work to resolve any disputes, controversy or claim related to the matters within the authority of the JRC, including resolving disputes arising within any Working Group of the JRC; and

(j) perform such other functions as appropriate to further the purposes of this Agreement as determined by the Parties.

2.1.3 **JDC Responsibilities**. In addition to its overall responsibility for overseeing the Development Program, the JDC shall, in particular:

(a) work with the Project Co-Leaders to coordinate all material Development activities performed by each Party and monitor progress of the Development activities of the Parties hereunder;

(b) review and approve amendments to the Development Plan as proposed by the JPT;

(c) review and approve the allocation of resources and efforts for the Development Programs;

(d) determine the specific format and timeline for the transfer of any Deliverables in respect of any Development Program, as set forth in Section 7.1;

(e) discuss any potential Permitted Third Party TCR Agreements related to any Development Program under this Agreement, as appropriate, as set forth in Section 8.1;

(f) subject to ARTICLE 13, review and approve the overall Development communication and publication strategy as developed by the JPT;

(g) work to resolve any disputes, controversy or claim related to the matters within the authority of the JDC, including resolving disputes arising within any Working Group of the JDC; and

(h) perform such other functions as appropriate to further the purposes of this Agreement as determined by the Parties.

2.1.4 **Working Groups**. From time to time, a Committee may also establish and delegate duties to directed teams on an "as-needed" basis to oversee particular projects or activities within the scope of such Committee's oversight and responsibility, and such teams shall be constituted and shall operate as the Committee determines ("**Working Group(s)**"). Each Working Group and its activities shall be subject to the oversight, review and approval of, and shall report to, the Committee that established such Working Group. In no event shall the authority of a Working Group exceed that specified for the appointing Committee set forth in this ARTICLE 2, and Working Groups are not authorized to amend the Research Plan or Development Plan. The Parties agree that promptly following the Effective Date, the Parties will establish: (a) a Joint Project

Team ("**JPT**") as a Working Group of both of the JDC and the JRC, to facilitate the Parties research and Development efforts across the collaboration contemplated under this Agreement, as set forth in additional detail in Section 2.2: and (b) a joint Working Group for Intellectual Property matters under the oversight of both of the JDC and the JRC ("**IPWG**") to control and direct certain Intellectual Property and Patent matters under the collaboration, as set forth in additional detail in Section 2.3.

2.2 **Joint Project Team**.

2.2.1 **Formation and Composition**. As soon as reasonably possible and in any event within [***] days after the Effective Date, the Parties shall establish the JPT as a Working Group of the JRC and JDC, which shall serve as the core team, with respect to the management and implementation of the Research Programs and Development Programs. The JPT shall be composed of a mutually agreed number of individual(s) from each Party ([***]) with the necessary scientific and technical expertise appropriate for the tasks then being undertaken and the stage of research or Development, in terms of their seniority, availability, function in their respective organizations, training and experience. For the JPT, each Party shall designate one of its representatives as its primary JPT contact (each, a "**Project Co-Leader**"). Each Party may replace its representatives from time to time by informing the other Party in writing (which may be by email); *provided*, that if a Party's representative is unable to attend a meeting, such Party may designate a knowledgeable alternate to attend such meeting and perform the functions of such representative. The JPT shall be subject to the oversight, review and approval of the JRC or JDC, as the case may be.

2.2.2 **JPT Responsibilities**. In addition to its overall responsibility for managing the Research Programs or Development Programs, the JPT shall, in particular:

(a) ensure that each Party keeps the JPT informed regarding all material activities performed by such Party under this Agreement that are within the purview of the JPT;

(b) prepare draft amendments (as needed) to the Research Plan or Development Plan, and submit draft amended Research Plan or Development Plan to the JRC or JDC for approval, as applicable;

(c) collaboratively review and evaluating results, publications or reports with relevance to the Collaboration Field, including identifying Antigens of interest to the collaboration;

(d) following the Effective Date, but no later than the filing of the first (1st) IND, agree upon a plan ("**TCR Sequencing Plan**") [***] set forth on the attached Exhibit 2.2.2(d) and obligations regarding quality assurance, capacity and throughput capabilities;

(e) prepare draft amendments (as needed) to the TCR Sequencing Plan, for approval by the JRC or JDC, as applicable, in connection with the Development Program and Commercialization;

(f) implement the Research Plan, Development Plan and TCR Sequencing Plan, and use commercially reasonable efforts to ensure that activities thereunder are performed in accordance with the approved timelines;

(g) develop a communication and publication plan for publications and public presentations related to Licensed Products and submit such plans to the JRC or JDC for approval, as applicable, and implement such approved plan;

(h) discuss and attempt to resolve any disputed matters related to the research collaboration and the scientific direction thereof (including manufacturing matters related thereto) before referring such matters to the JRC or JDC, as the case may be;

(i) discuss strategies for the coordination of the Parties' respective manufacturing efforts in order to reach the targeted end-to-end manufacturing times with a focus on pursuing those strategies that yield the highest value-add with respect to achievable efficiencies and consistent with the goals set forth in Section 7.3.3;

(j) coordinate timelines for incurring any manufacturing capital expenditures or personnel commitments reasonably necessary for manufacturing activities in relation to the Development and Commercialization of Licensed Products in the Collaboration Field, consistent with the goals set forth in Section 7.3.3, in relation to each Parties' expressed commitments to specific Development goals and completion of the activities constituting the Target Turnaround Objective within the Target Turnaround Time with respect to Shared Antigen TCR Products or Private Antigen TCR Products, as applicable;

(k) [***];

(l) develop plans and procedures for the transfer of any Materials or Know- How between the Parties, as set forth in Section 7.1; and

(m) perform such other functions as agreed to by the JRC or JDC or as specified in this Agreement.

2.3 **IPWG**.

2.3.1 **Formation and Composition**. As soon as reasonably possible and in any event within [***] days after the Effective Date, the Parties shall establish the IPWG as a Working Group, which IPWG shall consist of [***], unless otherwise agreed by the Parties. The IPWG shall provide a forum for the exchange of information between the Parties, and shall undertake a decision-making role with respect to the Intellectual Property matters arising under the collaboration, including with respect to the Prosecution and Maintenance of those Patents arising from the Research Programs and Development Programs and referenced in the definition of Valid Claim; *provided* that the Parties shall discuss such Prosecution and Maintenance with respect to the Adaptive Platform IP only as and to the extent such Adaptive Platform IP relates to the Licensed Products.

2.3.2 **IPWG Responsibilities**. In addition to its general overall responsibility for managing the Prosecution and Maintenance of Patents that cover TCR-Specific Platform IP arising under this Agreement, the IPWG shall discuss and determine:

(a) on a Patent application-by-Patent application basis, which Party is to take the lead in Prosecution and Maintenance of such Patents (or claims of such Patents), as set forth in additional detail in Section 11.3.2;

(b) on a Patent application-by-Patent application basis, which applications and claims should, in such applications, be Prosecuted and Maintained and which claims or applications, if any, should be abandoned;

(c) on a Patent application-by-Patent application basis, review and endeavor to settle any disagreement regarding which Party should own the relevant Patent application, based on the ownership principles set forth in Section 11.2.2;

(d) the relative strength of the current Patents included in the TCR-Specific Platform IP;

(e) cost effective strategies for the management of the Prosecution and Maintenance of Patents under the Agreement;

(f) strategies to terminate suspected or potential Infringement, that it considers in the best interest of both Parties, as set forth in Section 11.4.2; and

(g) strategies to defend against any Third Party Infringement Claim, that it considers in the best interest of both Parties and the Licensed Products, as set forth in Section 11.5.2.

2.4 **Meetings**.

2.4.1 **Committees and Working Groups**. Each Committee and Working Group shall meet at least [***] (unless otherwise agreed by the Parties) and at such other times as deemed appropriate by the respective Committee or Working Group, or as otherwise set forth in this ARTICLE 2. The presence of at least [***] shall constitute a quorum at a Committee or Working Group meeting. The Committees and Working Groups may meet in person or via teleconference or otherwise, in each case as agreed by the Committee or Working Group, *provided*, that for each Committee or Working Group at least [***] per calendar year shall be held in person, unless otherwise agreed by the Parties. For the avoidance of doubt, meetings of the JPT and IPWG are addressed in Section 2.4.2, and the JPT and IPWG shall not be considered Working Groups for the purposes of this Section 2.4.1.

2.4.2 **JPT and IPWG**. The JPT and IPWG shall meet at least [***] by audio or video teleconference or as otherwise agreed by the JPT or IPWG, as applicable.

2.4.3 **Meeting Agendas and Minutes**. Not later than [***] days after the Committees and the JPT and IPWG are formed, the JRC, JDC, JPT and IPWG shall each hold an organizational meeting by video or teleconference to establish their respective operating procedures, including establishment of agendas, and preparation and approvals of minutes as appropriate with respect to the role of such Committee or Working Group. Unless otherwise agreed, GNE's representatives on each Committee or Working Group shall be responsible for keeping minutes that record in writing all decisions made, action items assigned or completed, and other appropriate matters,

including preparing and circulating an agenda for each upcoming meeting of the relevant Committee or Working Group. Meeting minutes shall be sent to both Parties promptly after a meeting for review, comment and approval by each Party. A decision that is made at the Committee or a Working Group meeting shall be recorded in minutes, and decisions that are made by a Committee or Working Group outside of a meeting shall be documented in writing and be shown to be clearly agreed by all representatives of the Committee or Working Group as relevant.

2.4.4 **General**. Employees of each Party other than its Committee or Working Group representatives may attend meetings of the Committee or Working Group as non-voting participants, and, with the consent of the other Party, a Party's consultants and advisors involved in a Research Program or Development Program may attend meetings of the Committee or a Working Group as non-voting observers; *provided*, that such consultants and advisors are under obligations of confidentiality and non-use applicable to the Confidential Information of the other Party as required by ARTICLE 12 and each Party shall have the right to excuse the other Party's consultants and advisors from a meeting at any time. Each Party shall be responsible for all of its own expenses of participating in the Committee or any Working Group.

2.5 **Decision-Making**.

2.5.1 **JPT Disputes and Decision Making**. Each Party will discuss and attempt to resolve any potential or evolving disagreement related to the Research Program or Development Program (and not as between the Parties, which is subject to Section 18.1) through its respective Project Co-Leaders for a period of [***] business days before it is brought before the JPT for resolution. With respect to the decisions of matters brought before the JPT, [***] in all decisions, and the Parties shall attempt to make decisions by reaching unanimous agreement. If the JPT is unable to achieve a unanimous vote within [***] business days after the a matter is brought to vote before the JPT, or such longer period as the Project Co-Leaders agree, such matter shall be [***].

2.5.2 **Working Group Disputes and Decision Making**. Each Party shall use Commercially Reasonable Efforts to perform its responsibilities under any Working Group and provide reasonable support to the other Party in connection with the same. Unless otherwise agreed in connection with the formation of any Working Group (other than the JPT, which is addressed in Section 2.5.1), each Party will discuss and attempt to resolve any potential or evolving disagreement related to the subject matter of a given Working Group at the Working Group level prior to escalation to any Committee. With respect to the decisions of any Working Group (other than the JPT which is addressed in Section 2.5.1), [***] in all decisions, and the Parties shall attempt to make decisions by reaching unanimous agreement. If the relevant Working Group is unable to achieve a unanimous vote within [***] business days after the a matter is brought to vote before such Working Group then [***].

2.5.3 **Committee Disputes and Decision Making**. Each Party will discuss and attempt to resolve any potential or evolving disagreement related to the Research Program and/or Development Programs through the JPT, or the Parties' other activities under a given Working Group at the Working Group level, in accordance with Section 2.5.1 and Section 2.5.2, as applicable. For any matters that remain unresolved at the JPT or Working Group level and that are referred to the Committee for resolution, [***], and the Parties' representatives shall attempt to make decisions by reaching unanimous agreement. If the relevant Committee is unable to achieve a unanimous agreement within [***] business days after the matter is brought to vote before such Committee then [***].

2.6 **Dissolution**. Upon the earlier of expiration or termination of the last Research Program or Development Program, the JRC and JPT will have no further responsibilities or authority under this Agreement and the JPT and JRC will be deemed dissolved by the Parties. The JDC shall continue to exist until the First Commercial Sale of a Licensed Product in the U.S., Japan or any Major European Market at which time it shall automatically cease operations, unless earlier disbanded. Upon the mutual agreement of the Parties, any Committee or Working Group may be dissolved by the Parties. Following any dissolution of a Committee or Working Group, such Committee or Working Group will have no further responsibilities or authority under this Agreement; *provided* that the Parties will be directly responsible for any exchange of information, Know-How or reports for which the disbanded Committee or Working Group was responsible prior to such dissolution, unless otherwise agreed.

2.7 **Alliance Managers**. Promptly following the Effective Date, each Party shall designate an individual to act as the primary business contact and relationship manager for such Party for matters related to this Agreement (the "**Alliance Managers**"). The Alliance Managers shall: (a) serve as the primary contact points between the Parties for the purpose of providing the other Party with information on the progress of such Party's activities under this Agreement; (b) facilitate the flow of information and collaboration between the Parties; and (c) act as advocates for the collaboration as a whole. The Alliance Managers may also bring any matter to the attention of any Committee or Working Group if such Alliance Manager reasonably believes that such matter warrants such attention and shall assist in the resolution of potential and pending issues and potential disputes in relation to the Agreement or the Parties' activities under the Research Programs and Development Programs, as applicable, in a timely manner to enable the Committees and the Parties to reach consensus and avert escalation of such issues or potential disputes. Either Party may replace its Alliance Manager at any time by informing the other Party's Alliance Manager in writing (which may be by email). Each Party shall ensure that its Alliance Manager is capable of performing the obligations required of an Alliance Manager under this Agreement and, absent agreement of the Parties, no Alliance Manager shall be eligible to serve as a Party's representative on any Committee or Working Group.

2.8 **Limitations on Authority**. Each Party shall retain the rights, powers, and discretion granted to it under this Agreement, and no such rights, powers, or discretion shall be delegated to or vested in a Committee unless such delegation or vesting of rights is expressly provided for in this Agreement or the Parties expressly so agree in writing. No Committee shall have the power to amend, modify or waive compliance with this Agreement, which may only be amended or modified, or compliance with which may only be waived, as provided in Section 19.6.

2.9 **Escalation**. If, notwithstanding the Alliance Managers' assistance, the [***] is unable to resolve any dispute referred to such Committee within [***] business days after the date such dispute is first referred to such Committee or otherwise arises at the Committee level, or within such longer period as the Parties may agree, either Party may elect to submit such issue to the CEO for Adaptive (or a person in an equivalent position at Adaptive), and a vice president of research or development for GNE (or their respective designees). These executives (or their appointed designees) are referred to collectively as the "**Executives**."

2.10 **Final Resolution**. In the event that the Executives are unable to resolve a given issue referred to them in accordance with Section 2.9 within [***] business days after the dispute is first referred to the Executives, then: [***] shall have final decision making authority, including selecting which Antigens will be screened by Adaptive using the Adaptive Platform under the Research Plan, selecting Prioritized TCRs for inclusion in Licensed Products and selecting Recurring Private Antigens for further evaluation under this Agreement; *provided*, that: [***]. Neither the JDC, JRC, Working Group nor either Party shall have the authority to amend or modify, or waive its own compliance with, this Agreement.

2.11 **Decision-Making Exceptions**. Notwithstanding the foregoing provisions of this ARTICLE 2, (a) if GNE reasonably and in good faith believes that there is a material safety issue with respect to a Licensed Product being used in a given Clinical Trial that is being conducted hereunder, then GNE shall have the right to suspend such Clinical Trial until such safety issue is reasonably resolved; or (b) if a Party reasonably and in good faith believes that a change to any Research Plan or Development Plan is required in order for either Party to ensure compliance with applicable laws, rules and regulations (or to satisfy a specific governmental authority request), then such Party shall notify the other Party thereof in writing, including a reasonably detailed description of such changes and requirements to comply with applicable laws, and such changes shall thereafter be deemed to an amendment to the then-current plan; *provided*, that the determination as to whether such changes are required to comply with applicable laws, rules and regulations or satisfy a governmental authority request shall be subject to ARTICLE 18.

ARTICLE 3
RESEARCH PROGRAM

3.1 **General**. The Parties shall conduct the Research Program in accordance with the Research Plan. Each Party shall comply with all applicable laws, rules and regulations (and in the case of Adaptive, cGLP) in the conduct of the Research Program. Each Party shall, in performing its obligations under the Research Program, assign responsibilities to those portions of its organization that have the appropriate resources, expertise and responsibility for such obligations. Each Party shall be responsible for its own costs associated with the activities it conducts under the Research Program.

3.2 **Research Program and Research Plan.** The Parties shall conduct and collaborate with respect to the Research Program, which will focus on: (a) expanding Adaptive's existing collection of Shared Antigen TCRs and identifying TCRs that will be included in the Shared Library and that may thereby be suitable for inclusion in Shared Antigen TCR Products; and (b) optimizing the discovery, identification and validation process for identifying Private Antigen TCRs, including in respect of clauses (a) and (b) timelines, scope, allocations of responsibilities, tasks and deliverables, as applicable. The Parties shall collaborate to agree upon a plan for the activities under the Research Program (the "**Research Plan**"). An initial draft of the Research Plan is attached to this Agreement as Exhibit 3.2. The JRC may amend in writing the Research Plan from time to time; *provided* that if the Parties are unable to agree upon any such amendment, the decision-making rules set forth in Sections 2.9 through 2.11 shall apply. During the period of any dispute regarding an amendment to the Research Plan, the Parties shall continue to perform activities in accordance with the most current mutually agreed version of the Research Plan.

3.3 **Shared Library and Prioritized TCRs**. In connection with the research related to Shared Antigen TCR Products, (a) GNE may request that Adaptive evaluate certain Shared Neoantigens or Tumor Associated Antigens; or (b) the Parties may agree through the JPT upon certain Shared Neoantigens or Tumor Associated Antigens that they wish to evaluate, in each case in order to generate Shared Antigen TCRs that are suitable to be designated as a Prioritized TCR, and potentially included in a Shared Antigen TCR Product, or (c) GNE may select (or Adaptive may propose through the JPT) for evaluation any Shared Neoantigens or Tumor Associated Antigens for which Adaptive has generated, as of the Effective Date, TCRs which are directed to such Antigen (such TCRs, the "**Existing Adaptive TCRs**", and each such Shared Neoantigen or Tumor Associated Antigen in (a), (b) or (c), a "**Shared Product Antigen Target**"). Following such selection, request or agreement, Adaptive, in accordance with the Research Plan, shall conduct the further activities set forth in the Research Plan to (i) identify TCRs directed to each such Shared Product Antigen Target, and (ii) to further evaluate and analyze such TCRs (including any Existing Adaptive TCRs that have not yet been determined to meet the criteria for a Prioritized TCR), using its TruTCR Criteria and the additional screening and selection assays that are part of the Adaptive Platform and described in the Research Plan, to identify a subset of such TCRs that are suitable to progress as a therapeutic product (such subset of TCRs, the "**Prioritized TCRs**") and that will be included in the Shared Library. Following the completion of such activities with respect to each Shared Product Antigen Target (including any Shared Product Antigen Target that generated Existing Adaptive TCRs that have already met the criteria to be designated as Prioritized TCRs), Adaptive will provide GNE, through the JPT, with a data package, which will include: (A) a listing of and detailed information and data relating to the Prioritized TCRs for such Shared Product Antigen Target (for clarity, all of which are included in the Shared Library), including the results of the testing and analyses (*e.g.* functional and safety screens, Antigen targets, etc.) that form the basis on which each of the Prioritized TCRs has been selected; and (B) a list of the Tumor Associated Antigens and Shared Neoantigens against which no TCRs meeting the TruTCR Criteria were identified (*i.e*. that did not generate any Prioritized TCR) and the information set forth on Part 2 of Exhibit 1.159 with respect to each such Shared Product Antigen Target (each such data package for each evaluated Shared Product Antigen Target, a "**Shared Antigen Data Package**"). During a period of [***] days following delivery of a Shared Antigen Data Package, or such longer period as the Parties may agree, [***].

3.4 **Subcontractors**. GNE may subcontract portions of its work under the Research Program to Affiliates or Third Parties; *provided*, that such subcontract is consistent with the terms and conditions of this Agreement. Adaptive may subcontract portions of its work under the Research Program (including those quantities to be supplied under the Research Program, as further specified in the Research Plan) to Affiliates and to the Third Parties listed on Exhibit 3.4 (as such list may be amended from time to time by mutual agreement) ("**Approved Subcontractors**"); *provided*, that in each case such subcontract is consistent with the terms and conditions of this Agreement. Except for Approved Subcontractors, Adaptive may not subcontract any portion of its work under the Research Program to any Third Party without GNE's prior written consent to the identity of such Third Party, such consent not to be unreasonably withheld, and *provided* that Adaptive shall not be required to get GNE's consent to the terms of any subcontract that is consistent with the terms and conditions of this Agreement. The subcontracting Party shall remain responsible (at its cost) for and shall ensure that each subcontractor complies with the terms and conditions of this Agreement.

3.5 **Reports; Records; and Inspections**.

3.5.1 **Progress Reports**. Each Party shall keep the other Party informed of its activities under the Research Program, and shall provide to the other Party's representatives on the JRC, regular summary updates at each meeting. If reasonably necessary for a Party to perform its work under the Research Program, that Party may request that the other Party provide more detailed information and data regarding the updates it earlier provided, and the other Party shall promptly provide the requesting Party with information and data as is reasonably available and reasonably necessary to conduct the Research Program, and such other information as the Parties agree. Neither Party is required to generate additional data or prepare additional reports to comply with the foregoing obligation. Subject to Section 12.2, all such reports, information and data provided by a Party shall be considered the providing Party's Confidential Information.

3.5.2 **Research Records**. Each Party shall maintain records of the Research Program (or cause such records to be maintained) in sufficient detail and in good scientific manner as will properly reflect all work done and results achieved by or on behalf of such Party in the performance of the Research Program. All laboratory notebooks shall be maintained for no less than the term of any Patent issuing therefrom. All other records shall be maintained by each Party during the Term. All such records of a Party shall be considered such Party's Confidential Information.

3.6 **Research Efforts**. The Parties shall use Commercially Reasonable Efforts to conduct their respective tasks under the Research Program.

ARTICLE 4
DEVELOPMENT PROGRAM

4.1 **General**. Following identification of Shared Antigen TCRs or Private Antigen TCRs through the Research Program, the Parties shall conduct the Development Program in accordance with the Development Plan. Each Party shall comply with all applicable laws, rules and regulations (and in the case of Adaptive, cGLP). Each Party shall, in performing its obligations under the Development Program, assign responsibilities to those portions of its organization that have the appropriate resources, expertise and responsibility for such obligations. Each Party shall be responsible for its own costs associated with the activities it conducts under the Development Program.

4.2 **Development Program and Development Plan**. Within [***] days after the Effective Date (or such alternative date as mutually agreed), the Parties shall draft and agree upon a Development plan directed to the Development of both Shared Antigen TCR Products and Private Antigen TCR Products, including manufacturing thereof in connection with such Development ("**Development Plan**"). The JDC may subsequently draft and agree upon additional development plans with respect to an individual Licensed Product or related Licensed Products. The JDC may amend in writing any Development Plans from time to time; *provided* that if the Parties are unable to agree upon any such amendment, the decision-making rules set forth in Sections 2.9 through 2.11 shall apply. During the period of any dispute regarding an amendment to the Development Plan, the Parties shall continue to perform activities in accordance with the most current mutually agreed version of the Development Plan. The Development Plan shall include:
(a) activities directed to the Development of Shared Antigen TCR Products following the identification of

Prioritized TCRs in accordance with Section 3.3; (b) activities directed to the Development of the Private Antigen TCR Product; (c) certain baseline immune monitoring work provided by Adaptive [***], as well as any additional immune monitoring work reasonably requested by GNE and agreed by Adaptive, [***], and shall be based upon the "Development Plan Overview" set forth on the attached Exhibit 4.2. GNE shall be responsible under the Development Program for selecting which Shared Antigen TCR Products and Private Antigen TCR Products shall enter into Clinical Trials.

4.3 **Subcontractors**. GNE may subcontract portions of its work under the Development Program to Affiliates or Third Parties; *provided*, that such subcontract is consistent with the terms and conditions of this Agreement. Adaptive may subcontract portions of its work under the Development Program (including those quantities to be supplied under the Development Program, as further specified in the Development Plan) to Affiliates and to the Third Parties listed on Exhibit 4.3 (as such list may be amended from time to time by mutual agreement) ("**Approved Development Subcontractors**"); *provided*, that in each case such subcontract is consistent with the terms and conditions of this Agreement. Except for Approved Development Subcontractors, Adaptive may not subcontract any portion of its work under the Development Program to any Third Parties without GNE's prior written consent to the identity of such Third Party, such consent not to be unreasonably withheld, and *provided* that Adaptive shall not be required to get GNE's consent to the terms of any subcontract that is consistent with the terms and conditions of this Agreement. The subcontracting Party shall remain responsible (at its cost) for and shall ensure that each subcontractor complies with the terms and conditions of this Agreement.

4.4 **Reports; Records; and Inspections**.

4.4.1 **Progress Reports**. Each Party shall keep the other Party informed of its activities under the Development Program, and shall provide to the other Party's representatives on the JDC regular summary updates at each meeting. If reasonably necessary for a Party to perform its work under the Development Program, that Party may request that the other Party provide more detailed information and data regarding the updates it earlier provided, and the other Party shall promptly provide the requesting Party with information and data as is reasonably available and reasonably necessary to conduct the Development Program, and such other information as the Parties agree. Neither Party is required to generate additional data or prepare additional reports to comply with the foregoing obligation. Subject to Section 12.2, all such reports, information and data provided by a Party shall be considered the providing Party's Confidential Information.

4.4.2 **Development Records**. Each Party shall maintain records of the Development Program (or cause such records to be maintained) in sufficient detail and in good scientific manner as will properly reflect all work done and results achieved by or on behalf of such Party in the performance of the Development Program. All laboratory notebooks shall be maintained for no less than the term of any Patent issuing therefrom. All other records shall be maintained by each Party during the Term. All such records of a Party shall be considered such Party's Confidential Information.

4.5 **Regulatory**. GNE shall be responsible for preparing and submitting regulatory documentation for Licensed Products. Adaptive shall support GNE, as may be reasonably necessary, in preparing and submitting, obtaining such regulatory documentation, and in the activities in support thereof, including providing information, documents or other materials required by applicable law for inclusion in or in support of regulatory documentation, in each case in accordance with the terms and conditions of this Agreement and the Development Plan.

4.6 **Development Efforts**. The Parties shall use Commercially Reasonable Efforts to conduct their respective tasks under the Development Program and to comply with the Development Plan Overview.

ARTICLE 5
COMMERCIALIZATION

5.1 **General**. Except as expressly set forth in Section 5.2, GNE shall have the sole right and authority to Commercialize the Licensed Products in the Territory. GNE shall conduct all Commercialization activities in compliance with all applicable laws, rules and regulations.

5.2 **Licensed Products**. Following Marketing Approval of each Licensed Product, GNE or its Affiliate shall be solely responsible for and control all Commercialization activities with respect to such Licensed Product; *provided*, that Adaptive shall continue to be responsible for the identification of the full sequences of Private Antigen TCRs, Shared Antigen TCRs (individually and collectively, "**TCR Sequences**") for each individual patient in accordance with the TCR Sequencing Plan, and providing the TCR Sequences to GNE and its Affiliates for the manufacture of the such Licensed Product.

5.3 **Commercialization Efforts**. GNE shall use Commercially Reasonable Efforts to seek Marketing Approval for, and Commercialize, at least one Licensed Product.

ARTICLE 6
LICENSES

6.1 **License to GNE**.

6.1.1 **License Grants**. Subject to the terms and conditions of this Agreement, including each Party's exclusivity obligations pursuant to ARTICLE 8, Adaptive hereby grants to GNE:

(a) a transferable, worldwide, license to use and practice all TCR-Specific Platform IP, to Develop and Commercialize Licensed Products and related Companion Diagnostics in the Field, which license shall be exclusive as to Licensed Products, and non-exclusive as to Companion Diagnostics, in each case, subject to Adaptive retaining the right to perform all activities it is required to conduct under the Research Program or Development Program or otherwise under this Agreement in connection with the Development and Commercialization of Licensed Products;

(b) a non-transferable (subject to Section 19.3), worldwide, perpetual, irrevocable, non-exclusive license to use and practice all data and information within each Shared Antigen Data Package and any other Know-How disclosed by Adaptive to GNE under the Agreement (but not, in each case, any such Know-How that is included in the Adaptive Core Platform IP) in connection with research and development activities conducted by GNE in any fields of use, *provided* that Adaptive's retained non-exclusive rights to use the data and information within the Shared Antigen Data Packages are subject to its exclusivity obligations under ARTICLE 8; and

(c) a non-transferable (subject to Section 19.3), worldwide, perpetual, irrevocable, non-exclusive license to use all Private Antigen TCR Product Data in connection with research and development activities conducted by GNE in any field of use, *provided* that Adaptive's retained non-exclusive rights to use such Private Antigen TCR Product Data are subject to Adaptive's exclusivity obligations under ARTICLE 8. For clarity, it is understood that Adaptive retains the right to use the Private Antigen TCR Product Data: (i) for research and development purposes in all fields, including to make improvements to the Adaptive Platform and the Screening Technology, subject to Adaptive's exclusivity obligations under ARTICLE 8; and (ii) in connection with the development and commercialization of products that are not therapeutic products (including diagnostic, prophylactic vaccine and immunological research products) and services.

(d) a royalty-free, non-transferable (subject to Section 19.3), sublicensable, perpetual, worldwide, irrevocable, non-exclusive license under any Adaptive Platform IP described in clauses (b) and (c) of Section 11.1.1 that is conceived, discovered, developed or otherwise made (i) solely by or on behalf of GNE or its Affiliates, or (ii) jointly by or on behalf of GNE or its Affiliates, on the one hand, and Adaptive or its Affiliates, on the other hand, in each case of (i) and (ii), in any fields of use other than (A) services for immunological research, (B) diagnostic services or products (other than Companion Diagnostics), and (C) immune monitoring (other than as contemplated under this Agreement).

(e) For clarity, with the exception of the license granted in Section 6.1.1(d), no license is granted to GNE pursuant to this Section 6.1.1, to use or practice any Adaptive Core Platform IP.

6.1.2 **Sublicenses.** GNE shall have the right to sublicense the rights granted under Section 6.1.1 to its Affiliates or Third Parties, *provided* that such sublicense is consistent with the terms and conditions of this Agreement, and provided further that GNE shall remain responsible for such Affiliate's or Third Party's compliance with all obligations under this Agreement applicable to such Affiliate or Third Party. For clarity, no grant of any sublicense to a Third Party or an Affiliate shall relieve GNE of its obligations hereunder.

6.1.3 **Subcontracting**. GNE shall have the unrestricted right to enter into subcontracts with Third Parties and Affiliates acting by or for the benefit of GNE with respect to the activities authorized under this Agreement; *provided*, that in each instance such subcontract is consistent with the terms and conditions of this Agreement.

6.2 **License to Adaptive**.

6.2.1 **License Grants**. Subject to the terms and conditions of this Agreement, including each Party's exclusivity obligations pursuant to ARTICLE 8, GNE hereby grants to Adaptive:

(a) a royalty-free, non-transferable (subject to Section 19.3), non-sublicenseable (except to any Approved Subcontractors if necessary), non-exclusive license under the GNE Collaboration IP to the extent necessary for Adaptive to conduct the activities it is required to conduct under the Research Program, Development Program and Commercialization activities under the TCR Sequencing Plan, including, to identify and evaluate Shared Antigen TCRs and Private Antigen TCRs; and

(b) a royalty-free, non-transferable (subject to Section 19.3), sublicenseable, perpetual, worldwide, irrevocable, non-exclusive license under the GNE Collaboration IP and any other Know-How disclosed by GNE to Adaptive under the Agreement (but not, in each case, any such Intellectual Property relating to the manufacture (including gene-editing, expression, production methods, formulations and process development) of TCRs or Licensed Products) for research and development purposes, including to make improvements to the Adaptive Platform and to use such improved Adaptive Platform for all purposes, subject to Adaptive's obligations under this Agreement, including ARTICLE 8.

(c) a royalty-free, non-transferable (subject to Section 19.3), sublicenseable, perpetual, worldwide, irrevocable, non-exclusive license under any GNE Collaboration IP (excluding any GNE Collaboration IP relating to the manufacture (including gene-editing, expression, production methods, formulations and process development) of TCRs or Licensed Products) that is conceived, discovered, developed or otherwise made (i) solely by or on behalf of Adaptive or its Affiliates, or (ii) jointly by or on behalf of Adaptive or its Affiliates, on the one hand, and GNE or its Affiliates, on the other hand, in each case of (i) and (ii), for any and all purposes outside of the Collaboration Field, subject to Adaptive's obligations under this Agreement.

6.2.2 **Sublicenses.** Adaptive shall have the right to sublicense the rights granted under Section 6.2.1(b) and (c) to its Affiliates or Third Parties, *provided* that such sublicense is consistent with the terms and conditions of this Agreement, and provided further that Adaptive shall remain responsible for such Affiliate's or Third Party's compliance with all obligations under this Agreement applicable to such Affiliate or Third Party. For clarity, no grant of any sublicense to a Third Party or an Affiliate shall relieve Adaptive of its obligations hereunder.

6.3 **No Additional Licenses**. Except as expressly provided in this Agreement, nothing in this Agreement shall grant either Party any right, title or interest in and to the Know-How, Patents or other intellectual property rights of the other Party (either expressly or by implication or estoppel).

ARTICLE 7
MANUFACTURING, SUPPLY AND TECHNOLOGY TRANSFER

7.1 **Materials**. Each Party shall use Commercially Reasonable Efforts to provide the other Party with the tangible materials ("**Materials**") and other deliverables specified under the Research Plan and Development Plans, including any IND-enabling packages or data prepared by Adaptive before or after the Effective Date including, as applicable, any Shared Antigen Data Package or Private Antigen TCR Product Data (collectively, along with the Materials, the "**Deliverables**"). The JRC and JDC (as applicable) shall determine the specific format and timeline for the transfer of such Deliverables.

7.2 **Rights of Use**. With respect to the Materials and Deliverables provided by one Party to another Party pursuant to Section 7.1, each Party shall have the right to use such Materials for the

activities under the Research Program or Development Program, and for those Commercialization activities for which it is responsible, and to exercise the rights granted to such Party pursuant to ARTICLE 6. Subject to the foregoing, all such Deliverables: (a) shall be used by a Party only in accordance with the terms and conditions of this Agreement; (b) shall not be used or delivered by a Party to or for the benefit of any Third Party except as expressly provided for in this Agreement or in a manner consistent with its licensed or retained rights; and (c) shall be used by a Party in compliance with all applicable laws, rules and regulations.

7.3 **Manufacturing and Supply**.

7.3.1 **Generally**. GNE shall be solely responsible for clinical and commercial supply, and manufacturing, of the Licensed Products in the Territory, subject to Adaptive's rights in the following sentence. Adaptive shall be solely responsible for supplying TCR Sequences under this Agreement, including data created or developed in connection with generating and evaluating TCR Sequences, in accordance with the TCR Sequencing Plan (as may be amended pursuant to Section 2.2.2(e)) for both the Development Program and for Commercialization activities. Each Party shall conduct all its respective manufacturing and supply activities in compliance with all applicable laws, rules and regulations. Each Party shall, in performing its respective obligations, assign responsibilities to those portions of its organization that have the appropriate resources, expertise and responsibility for such obligations. Each Party shall be responsible for its own costs associated with its respective manufacturing and supply activities it conducts under this Agreement, including for clarity, all costs associated with activities undertaken under this ARTICLE 7.

7.3.2 **Regulatory Filings.** GNE shall own and control all regulatory filings and Marketing Approvals for the Licensed Products, including for the end-to-end manufacturing process for the Licensed Products. Adaptive shall cooperate with, and provide all information and documentation reasonably requested by, GNE to support activities necessary to obtain and maintain Marketing Approvals for the Licensed Products. Adaptive shall notify and provide copies to GNE of all communication received from Regulatory Authorities relating to the activities (*e.g.*, the screening and identification of TCR Sequences) undertaken by or on behalf of Adaptive under this Agreement, and shall consider in good faith any comments timely provided by GNE in response to such communication or in preparation for any meetings with Regulatory Authorities related thereto.

7.3.3 **Adaptive Platform Improvements.** Adaptive shall be responsible for implementing changes in respect of the Screening Technology for the Adaptive Platform as follows: (a) [***] (i) where such changes are required by a Regulatory Authority for the Licensed Products, within a reasonable time following notification of such requirement; and (ii) in connection with any improvements required to optimize the Adaptive Platform for Development and/or Commercialization of Licensed Products in order to (A) complete the activities constituting the Target Turnaround Objective within the Target Turnaround Time; and/or (B) meet the throughput capacity necessary in order to meet the requirements for Clinical Trials and Commercialization, in each case of (A) and (B), in order that such improvements can be operational for Development and Commercialization of Licensed Products at a time to be mutually agreed by the Parties through the JPT; and (b) [***], for any changes or improvements to the Screening Technology not covered by (a), including any such improvements necessary to further reduce the number of days to complete

the activities constituting the Target Turnaround Objective (*i.e.* following changes already implemented by Adaptive under subclause (a)(ii)(A) above), as requested by GNE and following discussion at the JPT with respect to timing and implementation of such changes. The Parties acknowledge and agree that one of the goals of Development for the Private Antigen TCR Products is to reduce the time to completion by Adaptive of the processes described in Parts 2, 3, 4.1 and 4.2 of the TCR Sequencing Plan Requirements to [***] days from the date that tumor tissue or other sample is received from GNE in accordance with Part 1.2 of Exhibit 2.2.2(d).

7.3.4 **Supply Agreement.** GNE and Adaptive shall negotiate in good faith and enter into a supply agreement and quality agreement applicable to the use of the Adaptive Platform for the provision of TCR Sequences in connection with the Development Program and Commercialization activities consistent with this Agreement and the TCR Sequencing Plan Requirements (the "**TCR Sequence Supply Agreements**"), which TCR Sequence Supply Agreements shall provide: (a) for the supply of TCR Sequences in connection with the activities performed by Adaptive under the TCR Sequencing Plan; (b) a mechanism by which the Parties would work together in good faith for an agreed period of time to resolve actual or potential issues or failures arising in connection with the identification and supply of TCR Sequences prior to GNE having a right to require transfer of any Screening Technology under any TCR Sequence Supply Agreement, taking into account each Party's role in the end-to-end manufacturing timelines required for the effective Development and Commercialization of Licensed Products; and (c) other terms customary in the pharmaceutical industry to agreements of this nature, including reasonable inspection and audit rights for GNE and any Regulatory Authority to the extent required in connection with regulatory filings for the Licensed Products.

7.4 **Technology Transfer**. If Adaptive elects to engage a contract manufacturer to supply TCR Sequences in accordance with and as defined under the TCR Sequence Supply Agreement, then such contract manufacturer shall be an Approved Subcontractor (or otherwise approved by GNE) and Adaptive shall be responsible for all costs associated with the supply of the TCR Sequences by such contract manufacturer. Notwithstanding the preceding sentence, in connection with the supply of TCR Sequences for the Private Antigen TCR Products, if: (a) Adaptive notifies GNE in writing that it is unwilling for whatever reason or that it is or expects to be unable to perform the activities set out in the TCR Sequencing Plan and/or in the timelines set forth therein; or (b) Adaptive materially defaults on its obligations to supply TCR Sequences in accordance with and as defined under the TCR Sequence Supply Agreement, then in either instance upon GNE's election and written notice to Adaptive, [***] in connection with Adaptive's failure to perform such activities or material breach of such obligations, Adaptive will disclose and transfer to GNE, or a contract manufacturer mutually agreed by GNE and Adaptive, all Screening Technology, including licenses under applicable Intellectual Property, solely as necessary to enable GNE or such contract manufacturer to conduct those processes and techniques within the Adaptive Platform that are necessary for the identification of TCR Sequences (including creation or development of data in connection therewith) based upon Patient Samples, and supply to GNE of the Private Antigen TCR Product Data related thereto, for GNE's use in the manufacture of Licensed Products; *provided*, that such transfer shall be subject to the terms and conditions of Exhibit 7.4. Without limiting the foregoing, each Party will use reasonable efforts to facilitate the transfer and enablement of such Screening Technology. If Adaptive performs such technology transfer, Section 9.4.4 shall apply following such transfer.

ARTICLE 8
EXCLUSIVITY

8.1 **Adaptive**.

8.1.1 **Other TCR Cell Therapies**. During the Term and without modifying any exclusive licenses granted under ARTICLE 6, Adaptive shall not, and shall cause its Affiliates (subject to Section 8.1.4) not to, directly or indirectly, itself or through any license or collaboration with a Third Party, Develop or Commercialize any Other TCR Cell Therapy in the Collaboration Field. Notwithstanding the foregoing, with respect only to Tumor Associated Antigens, if and to the extent Adaptive or GNE believes in good faith that the collaboration under this Agreement may be enhanced by Adaptive entering into an agreement with a Third Party for the Development and Commercialization (non-exclusively) of an Other TCR Cell Therapy that is directed to one or more Tumor Associated Antigens (including those Tumor Associated Antigens that may be the targets of any Licensed Products), such Party shall discuss such potential arrangement in the JRC and/or JDC, as appropriate, and if the Parties mutually agree in writing, Adaptive shall have the right to negotiate and, subject to GNE's review and approval of any such agreement, enter into such agreement with such Third Party (any such permitted agreement, a "**Permitted Third Party TCR Agreement**"), and the Parties shall share the proceeds of any such Permitted Third Party TCR Agreement such that [***]% of such proceeds are allocated to Adaptive and [***]% of such proceeds are allocated to GNE.

8.1.2 **Prioritized TCRs**. During the Term, Adaptive shall not, and shall cause its Affiliates (subject to Section 8.1.5) not to, directly or indirectly, itself or through any license or collaboration with a Third Party, Develop or Commercialize any therapeutic product or service (whether as a part of any Cell Therapy, or other modality) that contains any Prioritized TCR that is directed to a cancer-specific Antigen, for any therapeutic use for any Indication. For clarity, during the Term, Adaptive and its Affiliates shall have the right to Develop or Commercialize (i) any diagnostic, immunological research or monitoring product that contains any Prioritized TCR, whether or not such diagnostic, or immunological research or monitoring product or service is directed to (or includes any component directed to) a cancer-specific Antigen; and (ii) any product that contains or utilizes any Prioritized TCR that is directed to an Antigen that is not a cancer-specific Antigen, for any therapeutic use for any Indication outside of any oncology Indication.

8.1.3 **Private Antigen TCRs**. During the Term, Adaptive shall not, and shall cause its Affiliates (subject to Section 8.1.5) not to, directly or indirectly, itself or through any license or collaboration with a Third Party, Develop or Commercialize any therapeutic product (whether as a part of any Cell Therapy, or other modality) containing any TCR that was administered to any patient as part of a Private Antigen TCR Product, for any therapeutic use for any oncology Indication. For clarity, during the Term, Adaptive and its Affiliates shall have the right to Develop or Commercialize: (a) any diagnostic or immunological research or monitoring product containing any TCR that was administered to any patient as part of a Private Antigen TCR Product, whether or not such diagnostic, immunological research or monitoring product is directed to (or includes any component directed to) a cancer-specific Antigen; and (b) any product containing any TCR that was administered to any patient as part of a Private Antigen TCR Product for any therapeutic use for any Indication outside of oncology.

8.1.4 **Expanded Use TCRs.** With respect to any Recurring Private Antigen, and without limiting Section 8.1.3, if as a result of Adaptive's screening, analysis and evaluation of such Recurring Private Antigen, Adaptive notifies GNE that it has generated one or more Prioritized TCRs directed to such Recurring Private Antigen (which may, for clarity have the same TCR Sequence as a TCR previously administered to a patient who received a Private Antigen TCR Product) (each of such Prioritized TCRs, an "**Expanded Use TCR**"), then Adaptive shall be obligated thereafter under Section 8.1.2, rather than Section 8.1.3 with respect to such Expanded Use TCR, *provided* however that the provisions of Section 8.1.2 shall not be applied retroactively to any TCR that Adaptive or its Affiliates performed any of the activities (itself or by granting any rights to any Third Party) permitted under Section 8.1.3(a) or (b) with respect thereto prior to its designation as an Expanded Use TCR (an "**Excluded Expanded Use TCR**"), and such Excluded Expanded Use TCR shall nonetheless continue thereafter to be subject to the obligations under Section 8.1.3, and not those under Section 8.1.2.

8.1.5 **Negative Covenant re Activities in the Expanded Field.** During the Term with respect to a specific Licensed Product for which an IND has been filed, Adaptive shall not, and shall cause its Affiliates not to, following such IND filing, directly or indirectly, itself or through any license or collaboration with a Third Party, Develop or Commercialize any Prioritized TCR contained in such IND for such Licensed Product for any use in the Expanded Therapeutic Field (whether or not such Prioritized TCR is directed to a cancer-specific Antigen).

8.1.6 **Effect on Affiliates.**

(a) In the event that there is a Change of Control where Adaptive is the Acquired Entity, then for purposes of this Section 8.1, "Adaptive" shall mean Adaptive Biotechnologies Corporation and its Affiliates existing immediately prior to the Change of Control transaction.

(b) In the event that there is a Change of Control where Adaptive is the Acquired Entity, the obligations of Sections 8.1.1, 8.1.2, 8.1.3 and 8.1.4 shall not apply to any Controlling Affiliate Program that exists as of the effective time of such Change of Control; provided that: (i) Adaptive and the Acquiring Affiliate Group establish internal processes, policies, procedures and systems to segregate proprietary or confidential information relating to any such Controlling Affiliate Program from any Confidential Information or Collaboration Data related to any Licensed Products, or related to the results of the Research Program or Development Program; (ii) the Acquiring Affiliate Group does not practice or use the Screening Technology, or any Adaptive Platform IP, Collaboration Data or Confidential Information of GNE or its Affiliates (or its or their sublicensees) in the course of the conduct of such Controlling Affiliate Program; and (iii) no personnel who were employees or individual contractors of Adaptive prior to the Change of Control transaction conduct any activities under such Controlling Affiliate Program. The foregoing requirements and restrictions shall not apply in the event such Acquiring Affiliate divests such Controlling Affiliate Program to a Third Party.

(c) **Certain Definitions**. As used herein:

(i) "**Acquired Entity**" means a Party undergoing a Change of Control.

(ii) "**Acquiring Affiliate**" means, with respect to an Acquired Entity undergoing a Change of Control transaction, an entity that (a) acquires control (as defined in the definition of Affiliate) of such Party after the Effective Date and (b) was a Third Party at the time of such acquisition.

(iii) "**Acquiring Affiliate Group**" means an Acquiring Affiliate and its affiliates existing immediately prior to or after the effective date of any Change of Control of the Acquired Entity, and specifically excludes Adaptive and its Affiliates existing immediately prior to the effective date of such Change of Control transaction.

(iv) "**Controlling Affiliate Program**" means, with respect to any Acquiring Affiliate, a program of activities conducted by or on behalf of such Acquiring Affiliate or other member of the Acquiring Affiliate Group involving the research, Development and/or Commercialization of any therapeutic Cell Therapy engineered to express any TCR which is (A) identified either by such Acquiring Affiliate or its affiliates, or any Third Party collaborator, without access to or use of the Screening Technology or Adaptive Platform IP and (B) directed against any Neoantigen or Tumor Associated Antigen.

8.2 **GNE**.

8.2.1 GNE retains the right (for itself, for its Affiliates or with a Third Party) to Develop and Commercialize any Other TCR Cell Therapy (such activities, a "**GNE Other TCR Cell Therapy Program**"); *provided*, that:

(a) GNE establishes or has in place internal processes, policies, procedures and systems to [***];

(b) GNE shall not and it shall cause its Affiliates not to, disclose to any Third Party (other than a Third Party working on behalf or for the benefit of GNE under this Agreement), or use itself or with such Third Party, [***] or other Confidential Information provided by Adaptive to GNE under this Agreement in the conduct of any such GNE Other TCR Cell Therapy Program; and

(c) to the extent that a product or Cell Therapy Commercialized by GNE or any of its Affiliates or Third Party sublicensee incorporates a TCR (including any modifications thereto) which is: [***].

8.3 **Use of Third Party TCRs and** [***] **Acquired TCRs**. GNE shall have all right to incorporate into any Shared Antigen TCR Product or any Private Antigen TCR Product any TCR (including any modifications thereto) which either (i) was generated under any GNE Other TCR Cell Therapy Program or (ii) was in-licensed from any Third Party, including from the [***], or (iii) any [***] Acquired TCR (any such TCR described in (i)-(iii), a "**Third Party TCR**"), in which event the royalties and other payments owed on any such Shared Antigen TCR Product or Private Antigen TCR Product shall nonetheless be as set out in ARTICLE 9, and in no cases will such product be deemed a "Third Party" product for purposes of a "Combination" in the calculation of royalties owed thereon.

8.4 [***]. Notwithstanding anything to the contrary in this Agreement, no Cell Therapy product incorporating either a [***] TCR or [***] Acquired TCR shall be deemed a Licensed Product or an Outside TCR Product unless such [***] TCR or [***] Acquired TCR is incorporated into any Shared Antigen TCR Product or any Private Antigen TCR Product in accordance with Section 8.3, and no royalty and no milestone payment shall be paid to Adaptive under this Agreement with respect to any such [***] TCR or any [***] Acquired TCR, except as and to the extent provided in Section 8.5. For clarity, nothing in this Agreement shall limit in any way the [***]:

8.4.1 "[***] **Acquired TCR**" means a TCR acquired or in-licensed from a Third Party by [***] or its Affiliates (which are understood to exclude GNE or [***]).

8.4.2 "[***]" means a research and development program that is directed towards research and development of a Cell Therapy product incorporating a TCR and that is conducted and funded, as among [***], GNE and its Affiliates, solely under the control of the [***]. For clarity, a [***] TCR Program may include research and development on TCRs and technology in-licensed or acquired by [***] from Third Parties and collaborations conducted by [***] with Third Parties.

8.4.3 "[***]" means the functional groups within GNE and its Affiliates that are responsible for research, development and commercialization of product candidates that originate from research, preclinical development and early clinical development programs conducted by [***] or GNE's Research and Early Development Organization. For clarity, research, development and commercialization activities of [***] activities expressly exclude [***]

8.4.4 "[***]" means the [***] (or its equivalent, if reorganized, unless it becomes part of GNE's Research and Early Development organization (or its equivalent) as a result of such reorganization) of [***], as further discussed in Section 8.5.

8.4.5 "[***] **TCR**" means a TCR that was researched and/or developed pursuant to a [***] TCR Program without utilizing Adaptive-generated TCR Sequences, Adaptive-generated TCR libraries or other Confidential Information of Adaptive (including GNE Collaboration IP) and for which the [***] has responsibility for further research, development and commercialization.

8.4.6 "[***] **TCR Program**" means a research and development program that is directed towards research and development of a Cell Therapy product incorporating a TCR and that is conducted and funded, as between GNE and its Affiliates, solely under the control of the [***]. For clarity, the [***] TCR Program may include research and development on TCRs and technology in-licensed or acquired by [***] from Third Parties and collaborations conducted by [***] with Third Parties.

8.4.7 "[***]" means [***].

8.4.8 "[***] **Acquired TCR**" means a TCR acquired or in-licensed from a Third Party by [***] or its Affiliates (other than GNE).

8.5 **Adding** [***] **as an Affiliate; Merging R&D Organizations**. Notwithstanding that, as of the Effective Date, [***] is not an Affiliate of GNE for purposes of this Agreement, if GNE provides notice to Adaptive: (a) electing to add [***] as an Affiliate under this Agreement; or (b) that [***] has been merged with and into or has become part of GNE's Research and Early Development organization (or its equivalent) as a result of a reorganization of [***], then [***].

ARTICLE 9
FINANCIAL TERMS

9.1 **Initial License Fee**. In consideration of the rights granted by Adaptive to GNE under ARTICLE 6 to the Adaptive Platform IP, GNE shall pay to Adaptive a one-time-license-fee in the amount of Three Hundred Million US Dollars ($300,000,000). Such payment shall be made within [***] days of the Effective Date and shall be non-refundable and non-creditable.

9.2 **Development and Commercial Event Payments**.

9.2.1 **Shared Antigen TCR Product Events**. Subject to the terms of Section 9.2.3 and Section 9.2.4, GNE will pay Adaptive the following one-time event payments upon the first Shared Antigen TCR Product achieving the following events:

Shared Antigen TCR Product Event	**Event Payment (US$)**		
	[***]	[***]	[***]
(a) [***]	[***]	[***]	[***]
(b) [***]	[***]	[***]	[***]
(c) [***]	[***]	[***]	[***]
(d) [***]	[***]	[***]	[***]
(e) [***]	[***]	[***]	[***]
Total Potential Event Payments:	[***]	[***]	[***]

[***].

9.2.2 **Private Antigen TCR Product Events**. Subject to the terms of Section 9.2.3 and Section 9.2.4, GNE will pay Adaptive the following one-time event payments upon the first Private Antigen TCR Product achieving the following events:

Private Antigen TCR Product Event	**Event Payment (US$)**		
	[***]	[***]	[***]
(a) [***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]
Total Potential Event Payments:	[***]	[***]	[***]

[***].

9.2.3 **Certain Terms**. It is understood and agreed that the following terms shall apply to the events achieved under Section 9.2.1 and Section 9.2.2.

(a) Event payments under Section 9.2.1 shall be due [***].

(b) For the avoidance of doubt, GNE's (including any sublicensees hereunder) cumulative obligation under Section 9.2.1 with respect to the: [***].

(c) For the avoidance of doubt, GNE's (including any sublicensees hereunder) cumulative obligation under Section 9.2.2 with respect to the: [***].

(d) If a milestone event in a given column of the tables in Section 9.2.1 or Section 9.2.2, is achieved by [***], as applicable, and GNE elects to cease Development and Commercialization of such Licensed Product, such that it does not achieve any later milestone events, then such later milestone events in the applicable column may be achieved by [***], as applicable, and later milestone events (and associated payments) in the second and third columns, respectively, would remain available for possible achievement by a [***], subject to the terms of this Section 9.2.

(e) For the milestone event payments specified in Section 9.2.1(a) and/or Section 9.2.2(a), there shall be one payment made for [***]; *provided that*, the preceding limitation does not limit the [***].

(f) If, for any reason: (i) a particular event specified in Section 9.2.1(b), (c), (d) or (e) is achieved without the event in Section 9.2.1(a) and/or 9.2.1(b) having been achieved, then upon the achievement of such subsequent event, the event payment applicable to such achieved event and the event payment(s) applicable to the preceding unachieved event(s) in Section 9.2.1(a) and/or 9.2.1(b), as applicable, shall be due and payable; or (ii) a particular event specified in Section 9.2.2(b), (c), (d) or (e) is achieved without the event in Section 9.2.2(a) and/or 9.2.2(b) having been achieved, then upon the achievement of such subsequent event, the event payment applicable to such achieved event and the event payment(s) applicable to the preceding unachieved event(s) in Section 9.2.2(a) and/or 9.2.2(b), as applicable, shall be due and payable.

9.2.4 **Notice of Achievement; Timing of Payment.** With respect to each event referred to in Section 9.2.1(a) and Section 9.2.2(a), GNE (or its sublicensee, if applicable) shall inform Adaptive within [***] days of the achievement of such event. With respect to each event referred

to in Sections 9.2.1(b) through (e) or Sections 9.2.2(b) through (e), GNE (or its sublicensee, if applicable) shall inform Adaptive within [***] days of the achievement of such event. GNE shall pay Adaptive the respective accrued and payable event payment within [***] days of receipt of an invoice from Adaptive with respect thereto.

9.3 **Net Sales Event Payments**.

9.3.1 **Shared Antigen TCR Product Net Sales Events**. Subject to the terms of Section 9.3.3, GNE shall pay Adaptive the following one-time event payments upon aggregate annual Net Sales of all Shared Antigen TCR Products achieving the following Commercialization events:

Net Sales Event for Shared Antigen TCR Products	Event Payment (in US dollars)
(a) [***]:	$ [***]
(b) [***]	$ [***]
(c) [***]	$ [***]
Total Potential Net Sales Event Payments for Shared Antigen TCR Products:	**$** [***]

It is understood and agreed that the event payments under this Section 9.3.1 shall be due only once. For the avoidance of doubt, GNE's (including any sublicensees hereunder) cumulative obligation under this Section 9.3.1 shall in no event exceed [***].

9.3.2 **Private Antigen TCR Product Net Sales Events**. Subject to the terms of Section 9.3.3, GNE shall pay Adaptive the following one-time event payments upon aggregate annual Net Sales of all Private Antigen TCR Products achieving the following Commercialization events:

Net Sales Event for All Private Antigen TCR Products	Event Payment (in US dollars)
(a) [***]:	$ [***]
(b) [***]:	$ [***]
(c) [***]:	$ [***]
Total Potential Net Sales Event Payments for all Private Antigen TCR Products:	**$** [***]

It is understood and agreed that the event payments under this Section 9.3.2 shall be due only once. For the avoidance of doubt, GNE's (including any sublicensees hereunder) cumulative obligation under this Section 9.3.2 shall in no event exceed [***].

9.3.3 **Notice of Achievement; Payment**. With respect to each event listed in Section 9.3.1 and Section 9.3.2, GNE shall inform Adaptive following the achievement of such event within [***] days after the quarter for which such event occurs. On or after Adaptive's receipt of such notice of achievement, Adaptive shall submit a written invoice to GNE for the corresponding event payment. Each such invoice shall specify the applicable milestone event, and, unless otherwise requested by GNE in writing Adaptive shall send such invoices to GNE at the address for GNE in the introduction to this Agreement, to the attention of Finance Manager. GNE shall pay Adaptive the respective accrued and payable event payment within [***] days of receipt of an invoice from Adaptive with respect thereto.

9.4 **Royalty Payments for Licensed Products**.

9.4.1 **Shared Antigen TCR Products**. Subject to the terms of Section 9.4.3 through Section 9.4.8, GNE shall pay Adaptive the following royalties on annual aggregate worldwide Net Sales of Shared Antigen TCR Products by GNE (or its sublicensee hereunder) during the Shared Royalty Term:

Annual Worldwide Net Sales (in US Dollars)	Royalty Rate Percentage
Up to [***]:	[***]%
Portion equal to or greater than [***] and less than [***]:	[***]%
Portion equal to or greater than [***] and less than [***]:	[***]%
Portion greater than [***]:	[***]%

9.4.2 **Private Antigen TCR Products**. Subject to the terms of Section 9.4.3 through Section 9.4.8, GNE shall pay Adaptive the following royalties on annual aggregate worldwide Net Sales of Private Antigen TCR Products by GNE (or its sublicensee hereunder) during the Private Royalty Term:

Annual Worldwide Net Sales (in US Dollars)	Royalty Rate Percentage
Up to [***]:	[***]%
Portion equal to or greater than [***] and less than [***]:	[***]%
Portion equal to or greater than [***] and less than [***]:	[***]%
Portion greater than [***]	[***]%

9.4.3 **Third Party Payments**.

(a) Adaptive. Adaptive shall have the obligation to make payments owed under written agreements entered into by Adaptive with Third Parties, as of the Effective Date or during the Term.

(b) GNE.

(i) Shared Antigen TCR Products. If, after the Effective Date, GNE (or an Affiliate or sublicensee) obtains a right or license under any Intellectual Property (which license includes one or more Patents) of a Third Party, where the practice of the Intellectual Property is [***] for the making, using, selling, offering for sale, or importing of a Shared Antigen TCR Product in a given country, then GNE may offset against the royalties due and payable by GNE to Adaptive with respect to such Shared Antigen TCR Product under Section 9.4.1 in such country, up to [***] of the amount of payments paid by GNE (or an Affiliate or sublicensee) to such Third Party, subject to Section 9.4.3(b)(iii) for such right or license (including the license to any know-how included in such Patent license); *provided*, that in no event shall such reductions reduce the royalty percentage rate payable to Adaptive on Net Sales of such Shared Antigen TCR Product in such country by more than [***] of what would otherwise be owed by GNE to Adaptive under Section 9.4.1. For clarity, any such amounts that would otherwise be offset if not for such minimum royalty percentage shall be applied to the subsequent royalty payment periods until such amount is fully offset, subject to the [***] floor in each such subsequent royalty payment period.

(ii) Private Antigen TCR Products. If, after the Effective Date, GNE (or an Affiliate or sublicensee) obtains a right or license under any Intellectual Property (which license includes one or more Patents) of a Third Party, where the practice of the Intellectual Property is [***] for the making, using, selling, offering for sale, or importing of a Private Antigen TCR Product in a given country, then GNE may offset against the royalties due and payable by GNE to Adaptive with respect to such Private Antigen TCR Product under Section 9.4.2 in such country, up to [***] of the amount of payments paid by GNE (or an Affiliate or sublicensee) to such Third Party, subject to Section 9.4.3(b)(iii), for such right or license (including the license to any know-how included in such Patent license); *provided*, that in no event shall such reductions reduce the royalty percentage rate payable to Adaptive on Net Sales of any such Private Antigen TCR Product in such country be below the greater of: (A) [***] ([***]%) of the applicable rates set forth in Section 9.4.2; or (B) [***] percent ([***]%); *provided further* that if the Parties effect a Screening Technology Transfer to GNE or to a Screening Contract Manufacturer under a Screening Technology Transfer Agreement in accordance with Section 7.4, then in no event shall such reductions further reduce the royalty percentage rate payable to Adaptive on Net Sales of any such Private Antigen TCR Product in such country below [***] percent ([***]%). For clarity, any such amounts that would otherwise be offset if not for such minimum royalty percentage shall be applied to the subsequent royalty payment periods until such amount is fully offset, subject to the applicable floor in each such subsequent royalty payment period.

(iii) Allocation of Payments for Third Party Patents. If GNE acquires rights or obtains a license under Third Party Patents where the payments for such acquisition of rights or under such Third Party license are subject to the permitted offset right under Sections 9.4.3(b)(i) or 9.4.3(b)(ii), and such Third Party Patents [***], then GNE shall [***].

9.4.4 **Third Party Technology Transfer Offsets**. Notwithstanding anything in this Agreement to the contrary, if the Parties effect a Screening Technology Transfer to GNE or to a Screening Contract Manufacturer under a Screening Technology Transfer Agreement in accordance with Section 7.4(a) or (b), then GNE may deduct from any royalty payments to Adaptive hereunder with respect to Private Antigen TCR Products: (A) (1) any fees paid by or on behalf of GNE to such Screening Contract Manufacturer for the manufacture and supply of such TCR Sequences (including for data created or developed in connection with generating the TCR Sequences), up to a maximum amount per patient of [***] percent ([***]%) of Adaptive's fully-burdened direct costs to generate the TCR Sequence for each patient as of the date of the Screening Technology Transfer; (2) any out-of-pocket costs and expenses incurred by GNE in connection with the Screening Technology Transfer; and (3) [***] *less* (B) an amount equal to [***] percent ([***]%) of any capital expenditures made by Adaptive in connection with and allocable to the manufacture and supply of TCR Sequences under this Agreement or the TCR Sequence Supply Agreement during the [***] months prior to the date upon which the Parties effect a Screening Technology Transfer to GNE or to a Screening Contract Manufacturer under a Screening Technology Transfer Agreement in accordance with Section 7.4(a) or (b). For clarity, any such amounts that would otherwise be deducted if not for such cap on deduction shall be applied to the subsequent royalty payment periods until such amount is fully deducted, subject to the applicable floor in each such subsequent royalty payment period.

9.4.5 **Biosimilar Products**.

(a) If following the first commercial sale of a Biosimilar in a country, Net Sales of a Shared Antigen TCR Product in such country in a given [***] month period fall by [***] percent ([***]%) from the Net Sales in the calendar year immediately preceding the calendar year in which such launch of the Biosimilar occurred, the royalties due and payable by GNE under Section 9.4.1 for all such Shared Antigen TCR Product shall be reduced by [***] percent ([***]%) in such country.

(b) As used herein, "**Biosimilar**" means, with respect to a given Shared Antigen TCR Product, any drug, biological product or Cell Therapy that: (i) is subject to review under an abbreviated approval pathway as a biosimilar, follow-on biologic or generic biological product, as those terms are commonly understood under the FD&C Act, 21 C.F.R. §§ 210, 211 and 600 et seq. and under the PHS Act, 21 C.F.R. §§ 600-610 and related rules and regulations, or the corresponding or similar laws, rules and regulations of any other jurisdiction; (ii) is approved as "biobetter", in each case of clauses (i) and (ii), of the relevant Shared Antigen TCR Product(s); or (iii) is subject to review under an abbreviated approval pathway as a "Cellular Therapy" (or substantially similar nomenclature therefor) in reliance on or by reference to the Marketing Approval for the relevant Shared Antigen TCR Product, in the event Regulatory Authorities promulgate such rules and regulations under the FD&C Act, or the corresponding or similar laws, rules and regulations of any other jurisdiction; *provided*, that in each instance under clauses (i)-(iii), which Biosimilar is sold by a Third Party that is not a licensee or sublicensee of GNE (or any of its Affiliates) and that has not otherwise been authorized, directly or indirectly, by GNE (or any of its Affiliates) to market and sell such product.

9.4.6 **Single Royalty Payment of Royalties on Sequential or Concurrent Administration**. No more than one royalty payment shall be due under this Section 9.4 with respect to a sale of a particular Licensed Product. Notwithstanding the foregoing, the Parties acknowledge and agree that a treatment regimen may contain both Shared Antigen TCR Products and Private Antigen TCR Products that are administered concurrently or sequentially (and that sequential administration may be separated by varying periods of time, depending on the Indication and the treatment regimen), and that such treatment regimen may result in such Licensed Products being invoiced and/or reimbursed in a given country either as two separate Licensed Products, or as a single or unitary price for a treatment regimen that includes both a Shared Antigen TCR Product and a Private Antigen TCR Product. For the avoidance of doubt:

(a) if a treatment regimen contains both Shared Antigen TCR Products and Private Antigen TCR Products administered concurrently or sequentially, and such treatment regimen is sold and invoiced as if it were a single Licensed Product (*i.e.* unitary pricing covering all Licensed Products in such treatment regimen), the royalty rate percentage and royalty payment for such Licensed Product or treatment regimen shall be calculated as a Private Antigen TCR Product under Section 9.4.2;

(b) if a treatment regimen contains both Shared Antigen TCR Products and Private Antigen TCR Products administered concurrently or sequentially, and each Licensed Product included in such treatment regimen is invoiced and/or reimbursed separately, then the royalty rate percentage and royalty payment shall be the rate applicable to the relevant type of Licensed Product at the time of invoice, under Section 9.4.1 or Section 9.4.2, as applicable;

(c) a Licensed Product that includes a Third Party TCR shall be treated for royalty purposes as if such Third Party TCR had been generated by the Parties under this Agreement, and shall in no event be treated as a Combination solely on the basis of the inclusion of a Third Party TCR. For clarity, if such Third Party TCR is included in a Shared Antigen TCR Product, Section 9.4.1 shall apply, and if such Third Party TCR is included in a Private Antigen TCR Product, Section 9.4.2 shall apply;

(d) a Shared Antigen TCR Product or Private Antigen TCR Product may contain multiple TCRs in the applicable Cell Therapy administered concurrently or sequentially, which shall be treated as a single Licensed Product, subject to Section 9.4.6(a) or Section 9.4.6(b), if applicable; and

(e) multiple royalties shall not be payable because the sale of a particular Licensed Product is Covered by more than one (1) Valid Claim in the country in which such Licensed Product is sold.

9.4.7 **Royalty Term**.

(a) The royalty obligations set forth in Section 9.4.1 will commence on a country-by-country basis upon the First Commercial Sale of any Shared Antigen TCR Product in the relevant country, and expire on a country-by-country basis upon: (i) the later of the

expiration of the last to expire Patent containing a Valid Claim that covers the sale of such Licensed Product in such country; and (ii) [***] years (such period, the "**Shared Royalty Term**"). For clarity, (A) if such last Valid Claim in a particular country expires prior to the [***] anniversary of the date of First Commercial Sale of such Shared Antigen TCR Product in such country, royalties shall continue to be payable on the sales of such Licensed Product in such country pursuant to Section 9.4.1 at the rates set forth therein until the [***] anniversary of the date of First Commercial Sale of such Shared Antigen TCR Product in such country; and (B) if no Valid Claim exists in such country at any time, royalties shall continue to be payable on the sales of such Shared Antigen TCR Product in such country pursuant to Section 9.4.1 at the rates set forth therein until the [***] anniversary of the date of First Commercial Sale of such Licensed Product in such country.

(b) The royalty obligations set forth in Section 9.4.2 will commence on a country-by-country basis upon the First Commercial Sale of any Private Antigen TCR Product in the relevant country, and expire on the [***] anniversary of the date of First Commercial Sale of the first Private Antigen TCR Product in such country (such period, the "**Private Royalty Term**").

9.4.8 **Rights Following Expiration of Royalty Term**. Upon expiry of its payment obligation hereunder with respect to a Licensed Product in a country, the licenses in Section 6.1 shall be fully paid-up on a non-exclusive basis in respect of that Licensed Product in that country; *provided*, that the foregoing shall not be interpreted to require Adaptive to continue to conduct Commercialization activities under the TCR Sequencing Plan (*i.e.*, to continue to provide TCR Sequences) with respect to the Private Antigen TCR Product. In addition, with respect to the Private Antigen TCR Product, at GNE's request on or about [***] months prior to the anticipated expiration of the Shared Royalty Term for such product in the United States (or if a Private Antigen TCR Product never achieves First Commercial Sale in the United States, then on or about [***] months prior to the anticipated expiration of the Private Royalty Term in the first country in the Major European Markets or Japan in which First Commercial Sale was achieved), the Parties shall meet and confer, and discuss in good faith a possible extension or other arrangement with respect to the sourcing of sequencing activities with respect to the TCR Sequences for the Private Antigen.

ARTICLE 10
PAYMENT TERMS; REPORTS; AUDITS

10.1 **Timing of Royalty Payment**. **Timing of Sales-Related Payments**. All payments of royalties under Section 9.4 and sales milestones under Section 9.3 shall be made within [***] days following the end of each calendar quarter in which the sale was made.

10.2 **Royalty Report**. For each calendar quarter for which GNE has an obligation to make royalty payments, such payments shall be accompanied by a report that specifies for such calendar quarter the following information ("**Net Sales Report**"):

(i) [***];

(ii) [***]; and

(iii) the total royalties due to Adaptive.

If GNE is reporting Net Sales for more than one Licensed Product, the foregoing information shall be reported on a Licensed Product-by-Licensed Product basis.

10.3 **Mode of Payment**. All payments hereunder shall be made in immediately available funds to the account listed below (or such other account as Adaptive shall designate before such payment is due):

Pay to:	[***]
For credit of:	Adaptive Biotechnologies
Corporation Routing & Transit #:	[***]
SWIFT code:	[***]
Credit to Account #:	[***]
By Order of:	Genentech, Inc.

10.4 **Currency of Payments**. All payments under this Agreement shall be made in United States dollars, unless otherwise expressly provided in this Agreement. Net Sales outside of the United States shall be first determined in the currency in which they are earned and shall then be converted into an amount in United States dollars as follows: (a) with respect to sales by or on behalf of GNE, using GNE's customary and usual conversion procedures, consistently applied; and (b) with respect to sales by or on behalf of a given sublicensee, using the conversion procedures applicable to payments by such sublicensee to GNE for such sales.

10.5 **Blocked Currency**. If, at any time, legal restrictions prevent GNE (or a sublicensee) from remitting part or all of royalty payments when due with respect to any country in the Territory where Licensed Products are sold, GNE shall continue to provide Net Sales Reports for such royalty payments, and such royalty payments shall continue to accrue in such country, but GNE shall not be obligated to make such royalty payments until such time as payment may be made through reasonable, lawful means or methods that may be available, as GNE shall determine.

10.6 **Taxes**. Each Party shall comply with applicable laws and regulations regarding filing and reporting for income tax purposes. Neither Party shall treat their relationship under this Agreement as a pass through entity for tax purposes. All payments made under this Agreement shall be made free and clear of any and all taxes, duties, levies, fees or other charges, except for withholding taxes and VAT. GNE shall be entitled to deduct from payments made to Adaptive under this Agreement the amount of any withholding taxes required to be withheld, to the extent paid to the appropriate governmental authority on behalf of Adaptive (and not refunded or reimbursed). GNE shall deliver to Adaptive, upon request, proof of payment of all such withholding taxes. GNE shall provide reasonable assistance to Adaptive in seeking any benefits available to Adaptive with respect to government tax withholdings by any relevant law, regulation or double tax treaty. All payments made under this Agreement shall be exclusive of VAT (if applicable) and such VAT shall be paid promptly on receipt of a valid VAT invoice.

10.7 **Records; Inspection**.

10.7.1 **Records**. GNE agrees to keep, for [***] years from the year of creation, records of all sales of Licensed Products for each reporting period in which royalty payments are due, showing sales of Licensed Products for GNE and applicable deductions in sufficient detail to enable the report provided under Section 10.2 to be verified.

10.7.2 **Audits**. Adaptive shall have the right to request that such report be verified by an independent, certified and internationally recognized public accounting firm selected by Adaptive and acceptable to GNE (the "**CPA Firm**"). Such right to request a verified report shall: (a) be limited to the three-year period during which GNE is required to maintain the same; (b) not be exercised more than once in any calendar year; and (c) not be exercised more frequently than once with respect to records covering any specific period of time. Subject to Section 10.7.3, GNE shall, upon timely request and at least [***] business days advance notice from Adaptive and at a mutually agreeable time during its regular business hours, make its records available for inspection by such CPA Firm at such place or places where such records are customarily kept, solely to verify the accuracy of the reports provided under Section 10.2 and related payments due under this Agreement. The CPA Firm shall only state factual findings in the audit reports. The CPA Firm shall share all draft audit reports with GNE before the draft audit report is shared with Adaptive and before the final document is issued. The final audit report shall be shared with GNE at the same time that it is shared with Adaptive.

10.7.3 **Confidentiality**. Prior to any audit under Section 10.7.2, the CPA Firm shall enter into a written confidentiality agreement with GNE that: (a) limits the CPA Firm's use of the GNE's records to the verification purpose described in Section 10.7.2; (b) limits the information that the CPA Firm may disclose to the Adaptive to the numerical summary of payments due and paid; and (c) prohibits the disclosure of any information contained in such records to any Third Party for any purpose. The Parties agree that all information subject to review under Section 10.7.2 and/or provided by the CPA Firm to Adaptive is GNE's Confidential Information, and Adaptive shall not use any such information for any purpose that is not germane to Section 10.7.2.

10.7.4 **Underpayment; Overpayment**. After reviewing the CPA Firm's audit report, GNE shall promptly pay any uncontested, understated amounts due to Adaptive, with interest calculated in accordance with Section 10.7.5, from the date that such payments would have been owed to Adaptive. Any overpayment made by GNE shall be fully creditable against amounts payable in the subsequent payment period or if such payment period no longer exists or if the available credit in the above subsequent payment period is not sufficient to recoup the overpayment, Adaptive shall reimburse any such overpayment within [***] days. Any audit under Section 10.7.2 shall be at Adaptive's expense; *provided*, that GNE shall reimburse reasonable audit fees for a given audit if the results of such audit reveal that GNE underpaid Adaptive with respect to royalty payments by [***] percent ([***]%) or more for the audited period and such audited period includes at least [***] consecutive calendar quarters.

10.7.5 **Interest on Late Payments.** Any undisputed payments to be made hereunder that are not paid on or before the date such payments are due under this Agreement will bear interest at a rate per annum equal to the lesser of (a) the rate announced by Bank of America (or its successor) as its prime rate in effect on the date that such payment would have been first due plus [***]% or (b) the maximum rate permissible under applicable laws.

ARTICLE 11
INTELLECTUAL PROPERTY; OWNERSHIP

11.1 **Definitions**. As used in this ARTICLE 11:

11.1.1 "**Adaptive Platform IP**" means: (a) any Intellectual Property relating to the Adaptive Platform (including Intellectual Property associated with Adaptive's methods for identifying, sequencing and/or pairing Antigen-specific TCRs) owned or Controlled by Adaptive as of the Effective Date; (b) any improvements, updates and/or modifications to the Intellectual Property described in subclause (a) discovered, conceived, or reduced to practice solely by or on behalf of Adaptive or GNE, or jointly by the Parties, in the course of the activities performed under the Research Program or Development Program or otherwise under this Agreement, or otherwise by or on behalf of Adaptive (whether owned or Controlled) after the Effective Date and outside this Agreement; (c) all data, analyses and information used to generate Collaboration Data (and TCR Sequences included therein); (d) all derivatives, analyses, or modifications arising from the use of the Collaboration Data (and TCR Sequences included therein) that are generated by Adaptive outside of the Research Plan or Development Plans, and all Intellectual Property in any of the foregoing (the Intellectual Property in subclauses (a) through (d) collectively, the "**Adaptive Core Platform IP**"); (e) all Collaboration Data (including all TCR Sequences included in any Shared Antigen Data Packages and Private Antigen TCR Product Data); and (f) any subsequent improvements or modifications to the TCR Sequences in subclause (e) that are generated in whole or in part by Adaptive in performing the activities under the Research Plan or Development Plan, and all Intellectual Property in any of the foregoing (the Intellectual Property in subclauses (e) and (f), the "**TCR-Specific Platform IP**").

11.1.2 "**GNE Collaboration IP**" means any Intellectual Property (other than Adaptive Platform IP) that is discovered, conceived, or reduced to practice solely by or on behalf of Adaptive or GNE, or jointly by the Parties, in the course of the activities performed under the Research Program or Development Program. Notwithstanding the foregoing, GNE Collaboration IP expressly excludes any Intellectual Property: (a) discovered, developed, conceived or reduced to practice pursuant to the [***]; or (b) in-licensed or acquired by [***] or any of its Affiliates (other than GNE).

11.1.3 "**Prosecution and Maintenance**" or "**Prosecute and Maintain**", with respect to a particular Patent, means all activities associated with the preparation, filing (including any election under the Unitary Patent Convention), prosecution and maintenance of such Patent (and patent application(s) derived from such Patent), as well as re-examinations, reissues, applications for patent term adjustments and extensions, supplementary protection certificates and the like with respect to that Patent, together with the conduct of interferences, derivation proceedings, the defense of oppositions, defense of *Inter Partes* Review ("**IPR**") and other similar proceedings with respect to that Patent.

11.2 **Disclosure; Ownership; Inventorship; Assignment and Cooperation**.

11.2.1 **Disclosure**. During the Term, each Party shall promptly disclose to the other Party any GNE Collaboration IP or Adaptive Platform IP discovered, conceived, or reduced to practice by or for the disclosing Party in the course of the activities performed by or for such Party in connection with this Agreement. Inventorship shall be determined according to US law.

11.2.2 **Ownership**. As between the Parties, (a) Adaptive shall solely own the Adaptive Platform IP and subject to Section 6.1 and Section 8.1, Adaptive retains all rights to use the Adaptive Platform IP; and (b) GNE shall solely own GNE Collaboration IP and subject to Section 6.2 and Section 8.2, GNE retains all rights to use the GNE Collaboration IP.

11.2.3 **Assignment; Cooperation**. The assignments necessary to accomplish the ownership provisions set forth in this ARTICLE 11 are hereby made, and each Party shall execute such further documentation as may be necessary or appropriate, and provide reasonable assistance and cooperation, to implement the provisions of this ARTICLE 11. Each Party shall require all of its employees, Affiliates and any Third Parties working pursuant to this Agreement on its behalf, to assign (or otherwise convey rights) to such Party any Patents and Know-How discovered, conceived or reduced to practice by such employee, Affiliate or Third Party, and to cooperate with such Party in connection with obtaining patent protection therefore.

11.2.4 **CREATE Act**. It is the intention of the Parties that this Agreement is a "joint research agreement" as that phrase is defined in Public Law 108-53 (the "**Create Act**"). In the event that either Party to this Agreement intends to overcome a rejection of a claimed invention within the Adaptive Platform IP and/or GNE Collaboration IP pursuant to the provisions of the Create Act, such Party shall first obtain the prior written consent of the other Party. Following receipt of such written consent, such Party shall limit any amendment to the specification or statement to the patent office with respect to this Agreement to that which is strictly required by 35 USC § 103(c) and the rules and regulations promulgated thereunder and which is consistent with the terms and conditions of this Agreement (including the scope of the Research Program activities). To the extent that the Parties agree that, in order to overcome a rejection of a claimed invention within the Adaptive Platform IP and/or GNE Collaboration IP pursuant to the provisions of the Create Act, the filing of a terminal disclaimer is required or advisable, the Parties shall first agree on terms and conditions under which the patent application subject to such terminal disclaimer and the patent or application over which such application is disclaimed shall be jointly enforced, to the extent that the Parties have not previously agreed to such terms and conditions. In the event that GNE enters into an agreement with a Third Party with respect to the further research, Development or Commercialization of a Licensed Product, the Parties shall in good faith discuss whether Adaptive shall similarly enter into such agreement with such Third Party.

11.3 **Patent Prosecution**.

11.3.1 **Adaptive Controlled Prosecution and Maintenance**. Except as provided in Section 11.3.2, Adaptive shall, at its sole discretion (subject to its obligations under the IPWG) and sole expense, have the right (but not the obligation) to Prosecute and Maintain Patents included within: (a) the Adaptive Core Platform IP in all fields of use (the "**Adaptive Core**

Patents"), and (b) [***]. Adaptive will keep GNE reasonably informed of the status of such Prosecution and Maintenance. GNE will provide all reasonable cooperation and assistance to Adaptive at Adaptive's reasonable request and at [***] in Prosecution and Maintenance of the Adaptive Platform IP, including making data, reports, and scientific personnel reasonably available to prepare and prosecute patent applications.

11.3.2 **GNE Controlled Prosecution and Maintenance**. GNE shall, at its sole discretion (subject to its obligations under the IPWG) and sole expense, have the right (but not the obligation) to Prosecute and Maintain Patents within (a) the GNE Collaboration IP, and (b) [***]. GNE will keep Adaptive reasonably informed of the status of such Prosecution and Maintenance. Adaptive will provide all reasonable cooperation and assistance to GNE at GNE's reasonable request and at [***] in Prosecution and Maintenance of the GNE Collaboration IP, including making data, reports, and scientific personnel reasonably available to prepare and prosecute patent applications. Notwithstanding the division of Prosecution and Maintenance rights and responsibilities in connection with [***] set forth in Sections 11.3.1 and this Section 11.3.2, with respect to: (i) any Patent (or claim of a Patent) that claims [***] that either Party reasonably believes falls within subclause (b) of both Section 11.3.1 and this Section 11.3.2 (*e.g.* product-by-process claims); or (ii) Prosecution and Maintenance strategy in connection with segregation of claims or filing of continuations-in-part or divisional Patents that Cover or claim [***], the Parties shall first discuss such issues at the IPWG and shall determine which Party is to take the lead in Prosecution and Maintenance of such Patents.

11.3.3 **Patent Counsel**. The Parties shall use reasonable efforts to engage outside counsel (mutually agreed by the Parties) to consult in connection with the Prosecution and Maintenance of the Patents within the TCR-Specific Platform IP under Section 11.3.1 and Section 11.3.2.

11.3.4 **Transfer of Prosecution and Maintenance of GNE Collaboration IP**. If GNE elects not to Prosecute and Maintain any Patents claiming a composition of matter, or use thereof, of a TCR (including any modifications thereto) incorporated into a Licensed Product, GNE shall provide at least [***] days written notice to Adaptive. Thereafter, Adaptive shall have the right, but not the obligation, to Prosecute and Maintain any said Patents, at its sole expense and in its sole discretion, *provided* that with respect to any Patent claiming a Third Party TCR, Adaptive shall have such back-up right only to the extent permitted under GNE's agreement with the applicable Third Party. GNE will provide all cooperation and assistance to Adaptive in Prosecution and Maintenance. The Party assuming responsibility to Prosecute and Maintain said Patents may elect to require transfer of ownership or rights of said Patents at their sole discretion.

11.3.5 **Interferences Between the Parties**. If an interference or derivation proceeding is declared by the US Patent and Trademark Office between one or more of the Patents within the GNE Collaboration IP or Adaptive Platform IP, to the extent directed to a Licensed Product and that such declared interference or derivation proceeding does not involve any Patents owned by a Third Party, then the Parties shall in good faith establish a mutually agreeable process to resolve such interference or derivation proceeding in a reasonable manner in conformance with all applicable legal standards, but which prejudices neither Party and does not diminish the value of such Patents at issue.

11.4 **Enforcement Rights for Infringement by Third Parties**.

11.4.1 **Notice**. Each Party shall promptly notify, in writing, the other Party upon learning of any actual or suspected infringement or misappropriation of the GNE Collaboration IP or Adaptive Platform IP by the manufacture, use, import, offer for sale or sale by a Third Party of any product that is competitive with one or more Licensed Products, including if either Party reasonably believes that any claim of a Patent within the Adaptive Platform IP or GNE Collaboration IP is or may be subject to a declaratory judgment or similar action arising from such infringement, (each an "**Infringement**"). At the request of the Party receiving such notice, the other Party shall use commercially reasonable efforts to provide all evidence in its possession pertaining to the actual or suspected Infringement that it can disclose without breach of a preexisting obligation to a Third Party or waiver of privilege.

11.4.2 **Enforcement Actions**. The Parties shall consult (through the IPWG or as otherwise agreed by the Parties) as to potential strategies to terminate suspected or potential Infringement, including IPRs, oppositions, or other actions that may be initiated against a Third Party's Patent or any product or service that infringes or that interferes with either the Adaptive Platform IP or GNE Collaboration IP (each IPR, opposition or other action, an "**Opposition Proceeding**"), consistent with the overall goals of this Agreement. If the Parties fail to agree on such strategies:

(a) With respect to any Infringement by a Third Party of any Patent included in the TCR-Specific Platform IP with respect to (i) composition of matter claims (excluding product-by-process claims), (ii) therapeutic method claims relating to Cell Therapy and/or targeting cancer-specific Antigens, or (iii) manufacturing method claims, in each case in such Patents, GNE shall have the final decision right at the IPWG, and shall have the first right, but not the obligation, to seek to abate any actual or suspected Infringement by a Third Party, or to file suit, including an Opposition Proceeding, against any Third Party for Infringement of such claims in such Patents. If GNE does not, within [***] days of receipt of a notice under Section 11.4.1, take steps to abate the Infringement, or to file suit to enforce against such Infringement, then Adaptive shall have the right upon GNE's prior written consent (not to be unreasonably withheld, conditioned or delayed), but not the obligation, to take action to enforce against such Infringement, including initiating an Opposition Proceeding; *provided*, that if GNE is engaged in ongoing settlement discussions at the end of such [***] day period then Adaptive shall not be permitted to exercise such right unless such settlement discussions cease without reaching settlement or GNE ceases to pursue such discussions.

(b) Except as set forth in Section 11.4.2(a), Adaptive shall have the first right, but not the obligation, to seek to abate any actual or suspected Infringement by a Third Party, or to file suit, including an Opposition Proceeding, against any Third Party for Infringement, in each case of the Adaptive Platform IP (including, for clarity, all Adaptive Core Platform IP and the TCR-Specific Platform IP that is not subject to Section 11.4.2(a)). If Adaptive does not, within [***] days of receipt of a notice under Section 11.4.1, take steps to abate the Infringement, or to file suit to enforce against such Infringement, and such Infringement adversely impacts, or could adversely impact GNE's Net Sales of Licensed Product(s) in the applicable country, then GNE shall have the right, but not the obligation, to take action to enforce against such Infringement, including initiating an Opposition Proceeding; *provided*, that (i) if Adaptive is engaged in

ongoing settlement discussions at the end of such [***] day period then GNE shall not be permitted to exercise such right unless such settlement discussions cease without reaching settlement or Adaptive ceases to pursue such discussions, and (ii) GNE shall not, other than in accordance with Section 11.4.2(a), in respect of such Infringement, have the right to assert (A) any Adaptive Core Patent without Adaptive's prior written consent, or (B) any Patent claiming any TCR-Specific Platform IP if GNE or its Affiliates otherwise have the right to assert any Patent(s) outside of the TCR-Specific Platform IP that claim (1) the composition of a Licensed Product, (2) any method, composition or apparatus for the manufacture of a Licensed Product, or (3) any method of treatment employing or use of a Licensed Product.

(c) GNE shall have the sole right, but not the obligation, to seek to abate any actual or suspected Infringement by a Third Party, or to file suit, including an Opposition Proceeding, against any Third Party for Infringement, in each case of the GNE Collaboration IP.

(d) The non-controlling Party shall cooperate with the Party controlling any such action to abate or enforce (as may be reasonably requested by the controlling Party and at the controlling Party's expense), including, if necessary, by being joined as a party *provided*, that the non-controlling Party shall be indemnified by the controlling Party as to any costs or expenses, and shall have the right to be represented by its own counsel at its own expense. The Party controlling any such action shall keep the other Party updated with respect to any such action, including providing copies of all documents received or filed in connection with any such action.

11.4.3 **Settlement**. The Party controlling any such enforcement action described in Section 11.4.2 (an "**Enforcement**"), at its sole discretion, may take reasonable actions to terminate any alleged Infringement without litigation; *provided*, that if any such arrangement would adversely affect the non-controlling Party's rights under this Agreement, then that arrangement is subject to the non-controlling Party's prior written consent. The Party controlling any Enforcement may not settle or consent to an adverse judgment without the express written consent of the non-controlling Party (such consent not to be unreasonably withheld or delayed).

11.4.4 **Costs and Expenses**. The Party controlling any Enforcement shall bear all costs and expenses, including but not limited to litigation expenses, related to such enforcement actions.

11.4.5 **Damages**. Unless otherwise mutually agreed by the Parties, and subject to the respective indemnity obligations of the Parties set forth in ARTICLE 15, all damages, amounts received in settlement, judgment or other monetary awards recovered in an Enforcement with respect to activities of the Third Party that occurred prior to the effective date of such award shall be shared as follows:

(a) first, to reimburse the controlling Party for costs and expenses incurred under Section 11.4.4;

(b) second, if and to the extent lost sales are specifically determined by the adjudicating authority, to GNE in reimbursement for lost sales (net of royalties thereon which shall be paid in accordance with Section 9.4 and which specific award shall be deemed to be Net Sales in the calendar quarter in which the award was rendered for the purposes of the sales milestones in Section 9.3); and

(c) third, any amounts remaining to be allocated, including any amount that is not determined to be lost sales, [***] percent ([***]%) to GNE and [***] percent ([***]%) to Adaptive.

For the avoidance of doubt, if any settlement results in the granting to the person or entity accused of infringement or misappropriation of a sublicense of any of the Adaptive Platform IP or GNE Collaboration IP with running royalties payable on post-settlement sales by the alleged infringer, such alleged infringer shall be deemed to be a sublicensee of [***].

11.5 **Third Party Infringement Claims**.

11.5.1 **Notice**. In the event that a Third Party shall make any claim, give notice, or bring any suit or other *inter partes* proceeding against GNE or Adaptive, or any of their respective Affiliates or licensees or customers, for infringement or misappropriation of any intellectual property rights with respect to the research, development, making, using, selling, offering for sale, import or export of any Licensed Product ("**Third Party Infringement Claim**"), in each case, the Party receiving notice of a Third Party Infringement Claim shall promptly notify the other Party and use commercially reasonable efforts to provide all evidence in its possession pertaining to the claim or suit that it can disclose without breach of a pre-existing obligation to a Third Party or waiver of privilege.

11.5.2 **Defense**. The Parties shall consult (through the IPWG or otherwise) as to potential strategies to defend against any Third Party Infringement Claim, including by initiating any Opposition Proceeding against the relevant Third Party's Patent, consistent with the overall goals of this Agreement, including by being joined as a Party. If the Parties fail to agree on such strategies, and subject to the respective indemnity obligations of the Parties set forth in ARTICLE 15:

(a) Adaptive shall have the first right, but not the obligation, to defend any Third Party Infringement Claim, which may include initiating an Opposition Proceeding, related to the Adaptive Platform. If Adaptive does not, within [***] days of receipt of a notice under Section 11.5.1, provide written notice of its intention to defend the Third Party Infringement Claim, then to the extent that such Third Party Infringement Claim is brought against Adaptive and impairs GNE's ability to make, use or sell the Licensed Products, GNE shall have the right, but not the obligation, to take action, which may include initiating an Opposition Proceeding, to defend against such Third Party Infringement Claim; *provided*, that if Adaptive is engaged in ongoing settlement discussions at the end of such [***] day period then GNE shall not be permitted to exercise such right unless such settlement discussions cease without reaching settlement or Adaptive ceases to pursue such discussions.

(b) GNE shall have the first right, but not the obligation, to defend or enforce against any Third Party Infringement Claim, which may include initiating an Opposition Proceeding, related to the Licensed Products. If GNE does not, within [***] days of receipt of a notice under Section 11.5.1, provide written notice of its intention to defend the Third Party

Infringement Claim, then to the extent that such Third Party Infringement Claim is brought against Adaptive and relates to acts under the Research Program or Development Program, Adaptive shall have the right, but not the obligation, to take action, which may include initiating an Opposition Proceeding, to defend against such Third Party Infringement Claim; *provided*, that if GNE is engaged in ongoing settlement discussions at the end of such [***] day period then Adaptive shall not be permitted to exercise such right unless such settlement discussions cease without reaching settlement or GNE ceases to pursue such discussions.

11.5.3 The non-controlling Party shall cooperate with the controlling Party in connection with any such defense and counterclaim (as may be reasonably requested by the controlling Party and at the controlling Party's expense), including, if necessary, by being joined as a party *provided*, that the non-controlling Party shall be indemnified by the controlling party as to any costs or expenses, and shall have the right to be represented by its own counsel at its own expense. The Party controlling any such action shall keep the other Party updated with respect to any such action, including providing copies of all documents received or filed in connection with any such action. Any counterclaim or other similar action by a Party, to the extent such action involves any enforcement of rights under the GNE Collaboration IP or Adaptive Platform IP, will be treated as an enforcement action subject to Section 11.4.

11.5.4 **Settlement**. If any such defense under Section 11.5.2 would adversely affect the other Party's rights under this Agreement or impose a financial obligation upon the other Party or grant rights in respect, or affect the validity or enforceability, of the other Party's Patents, then any settlement, consent judgment or other voluntary final disposition of such Third Party Infringement Claim shall not be entered into without the consent of the other Party (such consent not to be unreasonably withheld).

11.5.5 **Costs and Expenses**. The Party controlling the defense of any Third Party Infringement Claim shall bear all costs and expenses, including but not limited to litigation expenses, to defend against any Third Party Infringement Claim.

11.6 **Trademarks**. GNE shall be free to use and to register in any trademark office worldwide, at its sole cost, any trademark for use with a Licensed Product in its sole discretion. GNE shall own all right, title and interest in and to any such trademark (including any and all claims and causes of action, rights to and claims for damages, restitution and injunctive and other legal and equitable relief for past, present and future infringement, dilution, misappropriation, violation, misuse, breach or default, with the right but no obligation to sue for such legal and equitable relief and to collect, or otherwise recover, any such damages) in its own name during and after the Term.

ARTICLE 12
CONFIDENTIALITY

12.1 **Non-Use and Non-Disclosure of Confidential Information**. During the Term, and for a period of ten (10) years thereafter, each Party shall: (a) except to the extent expressly permitted by this Agreement or otherwise agreed to in writing, keep confidential and not disclose to any Third Party any Confidential Information of the other Party; (b) except as is reasonably necessary in connection with activities contemplated by or the exercise of rights expressly

granted by this Agreement, or as otherwise agreed to in writing, not use for any purpose any Confidential Information of the other Party; and (c) take all reasonable precautions to protect the Confidential Information of the other Party (including all precautions a Party employs with respect to its own confidential information of a similar nature and taking reasonable precautions to assure that no unauthorized use or disclosure is made by others to whom access to the Confidential Information of the Party is granted).

12.2 **Exclusions Regarding Confidential Information**. Notwithstanding anything set forth in this ARTICLE 12 to the contrary, the obligations of Section 12.1 shall not apply to the extent that the Party seeking the benefit of the exclusion can demonstrate that the Confidential Information of the other Party:

(a) was already known to the receiving Party, other than under an obligation of confidentiality, at the time of receipt by the receiving Party;

(b) was generally available to the public or otherwise part of the public domain at the time of its receipt by the receiving Party;

(c) became generally available to the public or otherwise part of the public domain after its receipt by the receiving Party other than through any act or omission of the receiving Party in breach of this Agreement;

(d) was received by the receiving Party without an obligation of confidentiality from a Third Party having the right to disclose such information without restriction;

(e) was independently developed by or for the receiving Party without use of or reference to the Confidential Information or other intellectual property of the other Party with respect to which such receiving Party does not have a license; or

(f) was released from the restrictions set forth in this Agreement by express prior written consent of the Party.

12.3 **Authorized Disclosures of Confidential Information**. Notwithstanding the foregoing, a Party may use and disclose the Confidential Information of the other Party as follows:

(a) if required by law, rule or governmental regulation, including as may be required in connection with any filings made with, or by the disclosure policies of a major stock exchange; *provided*, that the Party seeking to disclose the Confidential Information of the other Party: (i) use all reasonable efforts to inform the other Party prior to making any such disclosures and cooperate with the other Party in seeking a protective order or other appropriate remedy (including redaction); and (ii) whenever possible, request confidential treatment of such information; to the extent such use and disclosure is reasonably required in the Prosecution and Maintenance of a Patent within the GNE Collaboration IP or Adaptive Platform IP in accordance with this Agreement;

(b) as reasonably necessary to obtain or maintain any Marketing Approval, including to conduct preclinical studies and Clinical Trials and for pricing approvals, for any Licensed Products, *provided*, that the disclosing Party shall take all reasonable steps to limit disclosure of the Confidential Information outside such regulatory agency and to otherwise maintain the confidentiality of the Confidential Information;

(c) to take any lawful action that it deems necessary to enforce compliance with the terms and conditions of, this Agreement, *provided*, that the Party seeking to disclose the Confidential Information of the other Party: (i) use all reasonable efforts to inform the other Party prior to making any such disclosures and cooperate with the other Party in seeking a protective order or other appropriate remedy (including redaction); and (ii) whenever possible, request confidential treatment of such information; or

(d) to the extent necessary, to permitted sublicensees, licensees, collaborators, vendors, consultants, agents, attorneys, contractors and clinicians under written agreements of confidentiality at least as restrictive as those set forth in this Agreement, who have a need to know such information in connection with such Party performing its obligations or exercising its rights under this Agreement. Further, the receiving Party may disclose Confidential Information to existing or potential acquirers, merger partners, permitted collaborators, licensees and sources of financing or to professional advisors (*e.g.*, attorneys, accountants and prospective investment bankers) involved in such activities, for the limited purpose of evaluating such transaction, collaboration or license and under appropriate conditions of confidentiality, only to the extent necessary and with the agreement by those permitted individuals to maintain such Confidential Information in strict confidence.

12.4 **Return of Confidential Information**. Except as expressly permitted under this Agreement, following any termination of this Agreement each Party shall, upon written request by the other Party, promptly return or destroy all Confidential Information received from the disclosing Party (at the disclosing Party's election and cost), including any copies thereof, (except one copy of which may be retained for archival purposes solely to ensure compliance with the terms of this Agreement).

12.5 **Terms of this Agreement**. Each Party agrees not to, and to cause its Affiliates not to, disclose to any Third Party any terms of this Agreement without the prior written consent of the other Party hereto, except each Party and its Affiliates may disclose the terms of this Agreement: (a) to advisors (including financial advisors, attorneys and accountants), actual or bona fide potential acquirors or investors, on a need to know basis, in each case under appropriate confidentiality provisions substantially equivalent to those in this Agreement or, with respect to investors, on terms common in the industry with respect to the duration of the confidentiality period; or (b) to the extent necessary to comply with applicable laws and court orders (including securities laws or regulations and the applicable rules of any public stock exchange).

12.6 **Termination of Prior Agreements**. As of the Effective Date, as between the Parties, this Agreement supersedes the Non-Disclosure Agreement, effective as of September 10, 2018, by and between GNE and Adaptive, ("**Non-Disclosure Agreement**") but only insofar as each relates to the subject matter of this Agreement. All "Confidential Information" (as defined in such agreement) exchanged between the Parties thereunder relating to the subject matter of this Agreement shall be deemed Confidential Information hereunder and shall be subject to the provisions of this ARTICLE 12.

12.7 **No License**. As between the Parties, Confidential Information disclosed hereunder shall remain the property of the disclosing Party. Disclosure of Confidential Information to the other Party shall not constitute any grant, option or license to the other Party, beyond those licenses expressly granted under ARTICLE 6 or ARTICLE 16, under any patent, trade secret or other rights now or hereinafter held by the disclosing Party.

ARTICLE 13
PUBLICITY; PUBLICATIONS; USE OF NAME

13.1 **Publicity**. GNE hereby agrees to Adaptive issuing a press release, reviewed and approved by the Parties, concerning the execution of this Agreement within [***] days after the Effective Date. The text of any other press releases or other public statements or announcement concerning this Agreement, the subject matter hereof, or the research, development or commercial results of products hereunder (a "**Release**") shall be addressed pursuant to Section 13.2 through Section 13.5. Any such Release shall not include any financial terms of this transaction, other than to the extent allowed pursuant to Section 13.3 through Section 13.5 or as may otherwise be agreed in writing by the Parties on a case-by-case basis.

13.2 **Releases Reporting the Activities of the Research Program**. Subject to Section 13.5, neither Party may issue a Release reporting on the activities under the Research Program without the prior written consent of the other, which consent shall not be unreasonably withheld, conditioned or delayed.

13.3 **Releases Reporting on the Development or Commercialization of Licensed Products**. Subject to Section 13.5, in connection with the Development (outside the Research Program) or Commercialization of Licensed Products, the following shall apply:

13.3.1 **Required Filings; Investor Presentations**. Each disclosing Party acknowledges that the other Party receiving such Party's Confidential Information hereunder may, from time to time: (a) desire to publicly disclose through a: (i) press release; or (ii) media appearance, public announcement or presentation, such as presentations to analysts or shareholders (collectively, "**Investor Presentation(s)**"); or (b) be required to publicly disclose by applicable law, or regulation or rule of any stock exchange ("**Required Filing(s)**"), such as Forms 8-K, 10-Q and 10-K (each such disclosure in (a) and (b), a "**Public Disclosure**"), the terms of this Agreement, or significant Development and commercialization activity regarding any Licensed Products, to keep its investors reasonably informed of the achievement of milestones, significant events in the Development and regulatory process of Licensed Products, and commercialization activities and the like, and that such Public Disclosures may pertain to Confidential Information of the other Party that is not otherwise permitted to be disclosed under this ARTICLE 13 or ARTICLE 12 and which may be beyond what is required to be disclosed by applicable law (collectively, "**Investor Information**"). For clarity, "Investor Information" includes solely those items that are beyond what is required to be disclosed under applicable law.

13.3.2 **Review of Public Disclosures**. With respect to any Public Disclosure, except for the initial press release described in Section 13.1, the receiving Party (the "**Requesting Party**") shall provide the disclosing Party (the "**Reviewing Party**") with a draft of the Content (as defined in the next sentence) of the draft press release or Required Filing at least [***] business

days in advance of the issuance of the press release, filing of the Required Filing or scheduled date of the Investor Presentation. The word "**Content**" in this Section means any information relating to the activities contemplated by this Agreement, including Investor Information, and does not include any other business information of the Requesting Party or information pertaining to the "safe harbor" provisions of the Private Securities Litigation Reform Act of 1995 relating to "forward-looking statements." The Reviewing Party may notify the Requesting Party of any reasonable objections or suggestions that such Party may have regarding the Content in the Public Disclosure provided for review under this Section, and the Requesting Party shall reasonably consider any such objections or suggestions that are provided within [***] business days. The principles to be observed with respect to disclosures of Investor Information shall include accuracy, compliance with applicable law and regulatory guidance documents, reasonable sensitivity to potential negative reactions of a Regulatory Authority, reasonable sensitivity to commercial information of value to competitors, the need to keep investors informed regarding the Requesting Party's business. The Requesting Party shall use commercially reasonable efforts to adopt the reasonable requests of the Reviewing Party with respect to its Confidential Information and shall restrict the use of the Confidential Information of the Reviewing Party that is disclosed in Investor Presentations, under written agreements of confidentiality at least as restrictive as those set forth in this Agreement.

13.3.3 **Adaptive Platform Disclosures**. Notwithstanding the foregoing, GNE may not issue a Release without Adaptive's prior written consent, not be unreasonably withheld, conditioned or delayed if it includes reference to Adaptive by name or references identifying characteristics of Adaptive or the Adaptive Platform.

13.4 **Approved Releases**. If a Release requires consent pursuant to Section 13.2 or Section 13.3, once consent has been given both Parties may make subsequent public disclosure of the contents of such statement without the further approval of the Party whose consent was required; *provided*, that such content is not presented with any new data or information or conclusions and/or in a form or manner that materially alters the subject matter therein.

13.5 **Releases Required by Law or Regulation**. Each Party may issue any Release it is required to issue by applicable law or regulation.

13.6 **Publications**. Notwithstanding Section 13.2 through Section 13.5, both Parties recognize that the publication or disclosure of papers, presentations, abstracts or any other written or oral presentations regarding results of and other information regarding the Licensed Products may be beneficial to both Parties, *provided*, that such publications or presentations are subject to reasonable controls to protect Confidential Information, the patentability of inventions and other commercial considerations. Accordingly, the following shall apply with respect to papers and presentations proposed for disclosure by either Party:

(a) Subject to Section 13.6(b), with respect to any paper or presentation proposed for disclosure by GNE that utilizes information generated by or on behalf of GNE, so long as such paper or presentation does not contain any Confidential Information of Adaptive, or any information about the Adaptive Platform, GNE shall be free to make, publish and disclose such papers and presentations at its discretion. GNE shall acknowledge Adaptive, as appropriate, in any publication that discloses GNE's use of any Collaboration Data or any Licensed Products or the results thereof. For clarity, GNE shall not be permitted to publish or otherwise disclose any Confidential Information of Adaptive except as may be expressly permitted pursuant to Section 12.2, Section 12.3 or Section 13.6(b); and

(b) With respect to any paper or presentation proposed for disclosure by: (i) GNE which includes information generated by or on behalf of GNE that includes or relates to the Collaboration Data, including any publications containing Confidential Information of Adaptive; or (ii) Adaptive which utilizes information generated by or on behalf of Adaptive relating to the Licensed Products, including any publications containing Confidential Information of GNE, (the Party proposing such disclosure, the "**Disclosing Party**"), the other Party shall have the right to review and approve any such proposed paper or presentation (the "**Non-Disclosing Party**"). The Disclosing Party shall submit to the Non-Disclosing Party the proposed publication or presentation (including posters, slides, abstracts, manuscripts and written descriptions of oral presentations) at least [***] calendar days [***] calendar days for abstracts) prior to the date of submission for publication or the date of presentation, whichever is earlier, of any of such submitted materials. The Non-Disclosing Party shall review such submitted materials and respond to the Disclosing Party as soon as reasonably possible, but in any case within [***] calendar days [***] calendar days for abstracts) of receipt thereof. At the option of the Non-Disclosing Party, the Disclosing Party shall: (A) delete from such proposed publication or presentation any Confidential Information of the Non-Disclosing Party; and/or (B) delay the date of such submission for publication or the date of such presentation for a period of time sufficiently long (but in no event longer than [***] calendar days) to permit the Non-Disclosing Party to seek appropriate Patent protection. Once a publication has been approved by the Non-Disclosing Party, the Disclosing Party may make subsequent public disclosure of the contents of such publication without the further approval of the Non-Disclosing Party; *provided*, that such content is not presented with any new data or information or conclusions and/or in a form or manner that materially alters the subject matter therein, and the Disclosing Party provides reasonable notice to the Non-Disclosing Party of such publication no later than [***] days prior to public disclosure.

13.7 **No Right to Use Names**. Except as expressly provided herein, no right, express or implied, is granted by the Agreement to use in any manner the name of "Adaptive" or "Genentech" or any other trade name, symbol, logo or trademark of the other Party in connection with the performance of this Agreement.

ARTICLE 14
REPRESENTATIONS; WARRANTIES; COVENANTS

14.1 **Mutual Representations and Warranties**. Each Party represents and warrants to the other Party that as of the Effective Date:

(a) it is validly organized under the laws of its jurisdiction of incorporation;

(b) it has obtained all necessary consents, approvals and authorizations of all governmental authorities and other persons or entities required to be obtained by it in connection with this Agreement, subject to obtaining any required clearance of this Agreement under the HSR Act;

(c) the execution, delivery and performance of this Agreement have been duly authorized by all necessary corporate action on its part;

(d) it has the legal right and power to enter into this Agreement and to fully perform its obligations hereunder;

(e) the performance of its obligations will not conflict with such Party's charter documents or any agreement, contract or other arrangement to which such Party is a party; and

(f) it follows reasonable commercial practices common in the industry to protect its proprietary and confidential information, including requiring its employees, consultants and agents to be bound in writing by obligations of confidentiality and nondisclosure, and requiring its employees, consultants and agents to assign to it any and all inventions and discoveries discovered by such employees, consultants or agents made within the scope of, and during their employment, and only disclosing proprietary and confidential information to Third Parties pursuant to written confidentiality and non-disclosure agreements.

14.2 **Adaptive Additional Warranty**. Adaptive represents and warrants to GNE, as of the Execution Date, that:

(a) it has the legal right and power to extend the rights and licenses granted to GNE hereunder;

(b) it has never received any written notice asserting or alleging that the Adaptive Platform or the use thereof infringed or misappropriated the Intellectual Property of any Third Party; and

(c) it has no knowledge of any threatened or pending actions, lawsuits, interference or arbitration proceedings, in each case, relating to the Adaptive Platform IP.

14.3 **GNE Additional Warranty.** GNE represents and warrants to Adaptive that as of the Execution Date, it has the legal right and power to extend the rights and licenses granted to Adaptive hereunder.

14.4 **Mutual Covenants**.

14.4.1 **No Debarment**. In the course of the research, Development and Commercialization of the Licensed Products, neither Party (nor its Affiliates) shall use any employee or consultant (including of any (sub)licensee) who has been debarred or disqualified by any Regulatory Authority, or, to such Party's or its Affiliates' knowledge, is the subject of debarment or disqualification proceedings by a Regulatory Authority. Each Party shall notify the other Party promptly upon becoming aware that any of its or its Affiliates' employees or consultants has been debarred or is the subject of debarment or disqualification proceedings by any Regulatory Authority.

14.4.2 **Compliance**. Each Party and its Affiliates shall comply in all material respects with all applicable laws (including all anti-bribery laws) in the research, Development and Commercialization of the Licensed Products and performance of its obligations under this Agreement.

14.5 **Disclaimers**. EXCEPT AS OTHERWISE EXPRESSLY STATED IN THIS AGREEMENT, NEITHER PARTY MAKES ANY REPRESENTATION OR WARRANTY OF ANY KIND WITH RESPECT TO PATENTS, KNOW-HOW, MATERIALS OR CONFIDENTIAL INFORMATION SUPPLIED BY IT TO THE OTHER PARTY HEREUNDER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT.

ARTICLE 15
INDEMNIFICATION; LIABILITY

15.1 **Indemnification**. Subject to Section 15.2, each Party shall indemnify, defend and hold each of the other Party, its Affiliates and their respective directors, officers, and employees and the successors and assigns of any of the foregoing harmless from and against any and all liabilities, damages, settlements, penalties, fines, costs or expenses payable to a Third Party (including reasonable attorneys' fees and other expenses of litigation) (collectively, "**Loss**" or "**Losses**") arising, directly or indirectly out of or in connection with any Third Party claims, suits, actions, demands or judgments ("**Third Party Claims**") relating to: (a) the activities performed by or on behalf of such Party under this Agreement; (b) the activities performed by or on behalf of such Party in connection with the exercise of its licenses and rights hereunder, including, in the case of GNE and its Affiliates and its and their sublicensees hereunder, product liability claims to the extent relating to the Licensed Products; or (c) breach by such Party of the representations and warranties under ARTICLE 14, except, in each case, to the extent caused by the negligence or willful misconduct of the other Party.

15.2 **Procedure**. If a Party intends to claim indemnification under this Agreement (the "**Indemnitee**"), it shall promptly notify the other Party (the "**Indemnitor**") in writing of such alleged Loss. The Indemnitor shall have the right to control the defense thereof with counsel of its choice as long as such counsel is reasonably acceptable to Indemnitee. Any Indemnitee shall have the right to retain its own counsel at its own expense for any reason; *provided*, that if the Indemnitee shall have reasonably concluded, based upon a written opinion from outside legal counsel, that there is a conflict of interest between the Indemnitor and the Indemnitee in the defense of such action, in each of which cases the Indemnitor shall pay the fees and expenses of one law firm serving as counsel for the Indemnitee. The Indemnitee, and its employees and agents, shall reasonably cooperate with the Indemnitor and its legal representatives in the investigation of any Third Party Claims covered by this Agreement. The obligations of this ARTICLE 15 shall not apply to any settlement of any Third Party Claims if such settlement is effected without the consent of both Parties, which shall not be unreasonably withheld or delayed. The failure to deliver written notice to the Indemnitor within a reasonable time after the commencement of any such action, to the extent prejudicial to its ability to defend such action, shall relieve the Indemnitor of any obligation to the Indemnitee under this Section 15.2. It is understood that only GNE and Adaptive may claim indemnity under this Agreement (on its own behalf or on behalf of its Indemnitees), and other Indemnitees may not directly claim indemnity

hereunder. Each Indemnitee shall take and shall procure that its Affiliates take all such reasonable steps and action as are reasonably necessary or as the Indemnitor may reasonably require in order to mitigate any Losses arising out of or in connection with any Third Party Claims under this ARTICLE 15. Nothing in this Agreement shall or shall be deemed to relieve any Party of any common law or other duty to mitigate any losses incurred by it.

15.3 **Insurance**.

15.3.1 **Evidence of Insurance.** Within thirty (30) days of signing this Agreement, each Party shall provide the other Party with its certificate of insurance evidencing the insurance coverage set forth Section 15.3.2. Each Party shall provide to the other Party at least thirty (30) days prior written notice of any cancellation, non-renewal or material change in any of such insurance coverage.

15.3.2 **Insurance Coverage**. Subject to Section 15.3.4, each Party shall obtain and maintain from an insurance company having an A. M. Best Rating of "A-, VII" or better comprehensive general liability insurance customary in the industry for companies of similar size conducting similar business, and in any case sufficient to cover its obligations.

15.3.3 **Product/Clinical Trial Liability Insurance**. Commencing not later than thirty (30) days prior to the first use in humans of the first Licensed Product by GNE or any of its sublicensees, GNE and Adaptive each shall have and maintain such type and amounts of liability insurance covering the Development, and in the case of GNE, manufacture, use and sale of Licensed Products as is normal and customary in the industry generally for parties similarly situated, but, in any event, GNE shall have and maintain a minimum combined single limit per occurrence for products/Clinical Trials liability as follows: (a) a minimum limit of [***] dollars ($[***]) for any period during which GNE or any of its sublicensees is conducting a Clinical Trial(s) with any Licensed Product(s); and (b) a minimum limit of [***] dollars ($[***]) for any period during which GNE or any of its sublicensees is selling any Licensed Product(s). Each of the above insurance policies shall be primary insurance.

15.3.4 **Election to Self-Insure**. If either Party is an entity which, together with its Affiliates, has worldwide revenues from pharmaceutical sales in excess of $[***] per year, the obligations set forth in Section 15.3.1, Section 15.3.2 and Section 15.3.3 above shall not apply with respect to such Party, if such Party notifies the other Party in writing that it elects to provide coverage through a commercially reasonable program of self-insurance; *provided*, that the obligations set forth in Section 15.3.1, Section 15.3.2 and Section 15.3.3 shall resume with respect to such Party and its Affiliates, or successor-in-interest and its Affiliates, if such program of self-insurance is terminated or discontinued for any reason.

15.3.5 **No Limitations**. The insurance coverage required pursuant to this Section 15.3 shall not be construed to create a limitation of either Party's liability with respect to its indemnification obligations under this ARTICLE 15.

15.4 **Limitation of Damages**. NEITHER PARTY HERETO WILL BE LIABLE FOR INDIRECT, INCIDENTAL, CONSEQUENTIAL, SPECIAL, EXEMPLARY, OR PUNITIVE DAMAGES, INCLUDING LOST PROFITS, ARISING FROM OR RELATING TO THIS

AGREEMENT, REGARDLESS OF ANY NOTICE OF SUCH DAMAGES, EXCEPT IN RESPECT OF ANY BREACH OF A PARTY'S OBLIGATIONS UNDER ARTICLE 12 OR WITH RESPECT TO THE INDEMNIFICATION OBLIGATIONS OF THE PARTIES UNDER THIS ARTICLE 15 FOR CLAIMS OF THIRD PARTIES.

ARTICLE 16
TERM; TERMINATION

16.1 **Term**. The term of this Agreement (the "**Term**") shall commence on the Effective Date and, unless sooner terminated as provided in this ARTICLE 16 shall continue in full force and effect, on a country-by-country and Licensed Product-by-Licensed Product basis until there is no remaining royalty payment or other payment obligation in such country with respect to such Licensed Product under ARTICLE 9, at which time this Agreement shall expire with respect to such Licensed Product in such country, and all licenses granted to GNE with respect to such Licensed Product under this Agreement shall become fully-paid and non-exclusive. The Term shall expire on the date this Agreement has expired in its entirety with respect to all Licensed Products in all countries in the Territory.

16.2 **Termination by Either Party for Material Breach**. Either Party may terminate this Agreement by written notice to the other Party for any material breach of this Agreement by the other Party if, in the case of remediable breach, such material breach is not cured within [***] days [***] days for payment defaults) after the breaching Party receives written notice of such breach from the non-breaching Party; *provided*, that if such breach is not capable of being cured within such [***]-day (or [***]-day) period, the cure period shall be extended for such amount of time that the Parties may agree in writing is reasonably necessary to cure such breach, so long as: (a) the breaching Party is making diligent efforts to do so; and (b) the Parties agree on an extension within such [***]-day (or [***]-day) period. Notwithstanding anything to the contrary herein, if the allegedly breaching Party in good faith either disputes: (i) whether a breach is material or has occurred; or (ii) the alleged failure to cure or remedy such material breach, and provides written notice of that dispute to the other Party within the above time periods, then the matter will be addressed under the dispute resolution provisions in ARTICLE 18, and the notifying Party may not so terminate this Agreement until it has been determined under ARTICLE 18 that the allegedly breaching Party is in material breach of this Agreement, after which the notifying Party may immediately terminate the Agreement by providing notice to the breaching Party, unless the arbitrator rules that the breaching Party should be granted an additional period to cure such breach, in which case the notifying Party will not have the right to terminate until the breaching Party further fails to cure such breach within the relevant cure period.

16.3 **Termination by Either Party for Insolvency or Bankruptcy**. Either Party may terminate this Agreement effective on written notice to the other Party upon the liquidation, dissolution, winding-up, insolvency, bankruptcy, or filing of any petition therefor, appointment of a receiver, custodian or trustee, or any other similar proceeding, by or of the other Party where such petition, appointment or similar proceeding is not dismissed or vacated within [***] calendar days. All rights and licenses granted pursuant to this Agreement are, for purposes of Section 365(n) of Title 11 of the United States Code or any foreign equivalents thereof (as used in this Section 16.3, "**Title 11**"), licenses of rights to "intellectual property" as defined in Title 11. Each

Party in its capacity as a licensor hereunder agrees that, in the event of the commencement of bankruptcy proceedings by or against such bankrupt Party under Title 11, (a) the other Party, in its capacity as a licensee of rights under this Agreement, shall retain and may fully exercise all of such licensed rights under this Agreement (including as provided in this Section 16.3) and all of its rights and elections under Title 11; and (b) the other Party shall be entitled to a complete duplicate of all embodiments of such intellectual property, and such embodiments, if not already in its possession, shall be promptly delivered to the other Party: (i) upon any such commencement of a bankruptcy proceeding, unless the bankrupt Party elects to continue to perform all of its obligations under this Agreement; or (ii) if not delivered under (i), immediately upon the rejection of this Agreement by or on behalf of the bankrupt Party.

16.4 **Permissive Termination**. GNE shall also have the right to permissively terminate this Agreement, in its sole discretion, at any time by providing written notice to Adaptive; such termination to be effective [***] days after such notice.

16.5 **Termination for** [***]. If GNE or its Affiliates or sublicensees [***], then either: (a) GNE or its Affiliate or sublicensee shall [***]; or (b) [***], Adaptive shall have the right to terminate this Agreement on [***] days written notice to GNE; such termination to be effective immediately. For the avoidance of doubt, Adaptive may not terminate the Agreement if GNE or its Affiliate or sublicensee is required by legal process to [***]. In addition, notwithstanding the foregoing, Adaptive shall have no right to terminate this Agreement pursuant to this Section 16.5 if [***].

16.6 **Effects of Termination**.

16.6.1 **Effects of Termination in General**.

(a) Accrued Rights and Obligations. Expiration or termination of this Agreement for any reason shall not release either Party hereto from any liability, which as of the effective date of such expiration or termination, had already accrued to the other Party or which is attributable to a period prior to such termination, nor preclude either Party from pursuing any rights and remedies it may have hereunder or at law or in equity which accrued or are based upon any event occurring prior to the effective date of such expiration or termination. For clarity, it is understood and agreed that if this Agreement is terminated, but GNE nonetheless continues directly or indirectly after the effective date of such termination to Develop and/or Commercialize any Licensed Product that has entered into Clinical Trials (or has achieved Marketing Approval) on or before the effective date of such termination and for which the Royalty Term has not yet expired, GNE shall continue to owe to Adaptive the applicable milestones and royalties with respect thereto until the expiration of the relevant Royalty Term for such Licensed Product.

(b) Termination of Licenses. Subject to Section 9.4.8 and Section 16.6.1(c), upon termination of this Agreement: (i) all licenses (other than those non-exclusive licenses granted irrevocably and in perpetuity) under this Agreement shall terminate as of the effective date of such termination, including all sublicenses thereunder; and (ii) the restrictions and covenants under ARTICLE 8 shall have no further force and effect as of the effective date of such termination.

(c) Continuation of Sublicenses. Upon termination by Adaptive of this Agreement, any existing, permitted sublicense granted by GNE under this Agreement to any Third Party to Develop and/or Commercialize one or more particular Licensed Products shall survive; *provided* that the permitted sublicensee: (i) did not cause the breach that gave rise to a termination under Section 16.2 and is not in breach of such sublicense on the effective date of termination of this Agreement; and (ii) agrees with Adaptive in writing to be bound by all the terms and conditions of this Agreement which are relevant to and consistent with its sublicense, including without limitation the obligation to provide: (A) information and reports and pay milestone payments and royalties to Adaptive of the same nature, amount and scope as GNE is required to provide to and pay to Adaptive pursuant to this Agreement; and (B) reversion rights to Adaptive substantially equivalent to those set forth in Section 16.6.2(b); *provided* further that Adaptive shall not be obligated to assume any obligations under such sublicense that are greater than the obligations contained within this Agreement.

(d) Return of Confidential Information. Following expiry or any early termination of this Agreement and except with respect to Confidential Information included in those non-exclusive licenses granted irrevocably and in perpetuity, either Party that has Confidential Information of the other Party shall destroy (at such Party's written request): (i) all such Confidential Information in its possession as of the effective date of expiration or early termination (with the exception of one copy of such Confidential Information, which may be retained by the legal department of the Party that received such Confidential Information to confirm compliance with the non-use and non-disclosure provisions of this Agreement); and (ii) any Confidential Information of the other Party contained in its laboratory notebooks or databases; *provided*, that each Party may retain and continue to use such Confidential Information of the other Party to the extent necessary to exercise any surviving rights, licenses or obligations under this Agreement, if any.

(e) Inventory at Termination. Upon termination of this Agreement prior to the end of the Shared Royalty Term and/or Private Royalty Term in a given country, GNE and its Affiliates shall cease all Development and Commercialization of Licensed Products in such country(ies), provided however that GNE and its Affiliates (and permitted sublicensees whose licenses are not surviving under Section 16.6.1(c)) shall have the right to sell or otherwise dispose of all inventory of Licensed Products in all such countries then in its stock, subject to the applicable royalty and milestone payments due under this Agreement, and any other applicable provisions of this Agreement, and Adaptive covenants not to sue GNE or its permitted sublicensee for infringement under any of the Patents that were licensed by Adaptive to GNE immediately prior to such termination with respect to such activities conducted by GNE or its permitted sublicensee pursuant to this Section 16.6.1.

(f) Survival. In addition to any provisions specified in this Agreement as surviving under the applicable circumstances, the provisions of ARTICLE 1, ARTICLE 11, ARTICLE 12, ARTICLE 13, ARTICLE 14, ARTICLE 15 (*provided*, that with respect to ARTICLE 14 and ARTICLE 15, only with respect to those claims that arise from the acts or omissions of a Party prior to the effective date of termination or expiration), ARTICLE 18 and ARTICLE 19 (and Sections 6.1.1(b), 6.1.1(c), 6.1.1(d), 6.1.2, 6.2.1(b), 6.2.1(c), 6.2.2, 10.7, 16.1 and 16.6 shall survive any termination or expiration of this Agreement). In addition, the applicable provisions of ARTICLE 9 and ARTICLE 10 shall survive with respect to any outstanding unpaid amounts that accrued prior to the effective date of any termination or expiration of this Agreement (or any amounts owed as a result of the continuing payment obligations addressed in Section 16.6.1(a), if and as applicable).

16.6.2 **Effects of Certain Terminations.** In the event of termination of this Agreement by Adaptive pursuant to [***], or by GNE pursuant to [***], in addition to those provisions surviving under Section 16.6.1(f), upon such termination the following terms of this Section 16.6.2 shall apply:

(a) **Reversionary Rights for TCRs**.

(i) GNE shall grant to Adaptive the right to negotiate the terms of a non-exclusive license under the GNE TCR Technology to research, develop, import, use, make, have made, offer for sale and sell any TCR included within the Shared Library at the time of termination (each, a "**Reversion TCR**") whether alone or as a part of any product or service offering as provided in this Section 16.6.2(a). For the purposes of this Section 16.6, "**GNE TCR Technology**" shall mean all Intellectual Property Controlled by GNE or its Affiliates that: (A) arose as a result [***]; and (B) relates to [***]. Adaptive shall have [***] days following the effective date of termination to notify GNE in writing as to whether Adaptive elects to exercise such right to negotiate, in which case GNE will provide a summary of the rights within the relevant GNE TCR Technology;

(ii) If written notice is given that Adaptive does not want to exercise such right to negotiate, or written notice is not given by Adaptive to GNE within said [***] day period, Adaptive will have waived its right to negotiate for such non-exclusive license under the GNE TCR Technology; or

(iii) If written notice is given within said [***] period that Adaptive elects to exercise such right to negotiate, Adaptive and GNE shall negotiate in good faith, for a period not to exceed [***] days from the date that GNE receives such notice from Adaptive, the commercially reasonable terms under which GNE would grant to Adaptive a non-exclusive, sublicensable license under the GNE TCR Technology identified in such notice from Adaptive, to research, develop, import, use, make, have made, offer for sale and sell any Reversion TCR whether alone or as a part of any product or service offering (the "**Reversion TCR License**"); and

(iv) To the extent the Parties cannot agree upon the terms upon which GNE would grant the Reversion TCR License within such [***] day negotiation period, Adaptive shall have the right to submit such disagreement to the arbitration provisions of Section 16.6.3 (and not Section 18.2).

(b) **Reversionary Rights for Non-TCR GNE IP**.

(i) With respect to all GNE Collaboration IP, and all Intellectual Property owned or Controlled by GNE and used in connection with the Development or Commercialization of any Licensed Product prior to the effective date of termination that in each case is not licensed to Adaptive pursuant to Section 16.6.2(b)(i) (the "**Additional Reversion IP**"), GNE shall grant to Adaptive the right to negotiate for an exclusive (or non-exclusive)

license under such Additional Reversion IP (or an exclusive license under the GNE TCR Technology), in either case to make, use, import, sell and offer for sale Licensed Products in the Territory. Adaptive shall have [***] days following the effective date of termination to notify GNE in writing as to whether Adaptive elects to exercise such right to negotiate, in which case GNE will provide a summary of the rights within the relevant Additional Reversion IP and GNE TCR Technology (if applicable);

(ii) If written notice is given that Adaptive does not want to exercise such right to negotiate, or written notice is not given by Adaptive to GNE within said [***] day period, Adaptive will have waived its right to negotiate for such exclusive license under the Additional Reversion IP; or

(iii) If written notice is given that Adaptive wants to exercise such right to negotiate, Adaptive and GNE shall negotiate in good faith, for a period not to exceed [***] days from the date that GNE receives such notice from Adaptive, the commercially reasonable terms under which GNE may grant to Adaptive an exclusive (or non-exclusive), sublicensable license under the Additional Reversion IP to make, have made, use, sell, offer for sale and import Licensed Products in the Territory; and

(iv) The terms set forth in this Section 16.6.2(b), including the decision by GNE to grant or not grant such a license (including the terms thereof) shall not be subject to the arbitration provisions of Section 18.2.

16.6.3 **Baseball-Style Arbitration.** If the Parties are unable to agree on the terms of the Reversion TCR License under Section 16.6.2, Adaptive may submit such dispute to arbitration for resolution in accordance with the following provisions:

(a) Adaptive shall notify GNE of its decision to initiate the arbitration proceeding pursuant to this Section 16.6.3 through written notice to GNE within [***] days of the end of [***] day negotiation period specified in Section 16.6.2(a)(iii) above;

(b) Within [***] calendar days following GNE's receipt of such notice, the Parties shall use commercially reasonable efforts to agree on an independent Third Party expert with at least ten (10) years of experience in the licensing of pharmaceutical compounds or products. If the Parties cannot agree on such expert within such time period, each Party shall nominate one independent expert within such [***]-day period, and the two experts so selected shall nominate the final independent expert within [***] calendar days of their nomination. If the two experts so selected cannot agree on the final independent expert, such final independent expert shall be nominated by the President of the Chamber of Commerce of New York. For the avoidance of doubt, it is understood and agreed that such final independent expert should have at least ten (10) years of experience in the licensing of pharmaceutical compounds or products.

(c) Within [***] calendar days of its appointment, the expert shall set a date for the arbitration, which date shall be no more than [***] calendar days after the date the arbitration is demanded under clause (a) above.

(d) The arbitration shall be "baseball-style" arbitration; accordingly, at least [***] calendar days prior to the arbitration, each Party shall provide the expert with a form of the definitive written agreement containing the terms of the Reversion TCR License proposed by it (each, a "**Proposed Agreement**"). Such Proposed Agreement may be no more than [***] pages, and must clearly provide and identify the Party's position with respect to the disputed matter(s);

(e) after receiving both Parties' Proposed Agreements, the expert will distribute each Party's Proposed Agreement to the other Party. [***] calendar days in advance of the arbitration (described in clause (f) below), the Parties shall submit to the expert and exchange response briefs of no more than [***] pages. The Parties' briefs may include or attach relevant exhibits in the form of documentary evidence, any other material voluntarily disclosed to the submitting Party in advance, or publicly available information. The Parties' briefs may also include or attach demonstratives and/or expert opinion based on the permitted documentary evidence. Neither Party may have any other communications (either written or oral) with the expert other than for the sole purpose of engaging the expert or as expressly permitted in this Section 16.6.3;

(f) the arbitration shall consist of a [***] hearing of no longer than [***], such time to be split equally between the Parties, in the form of presentations by counsel and/or employees and officers of the Parties. No live witnesses shall be permitted except expert witnesses whose opinions were provided with the Parties' briefs;

(g) no later than [***] calendar days following the arbitration, the expert shall issue his or her written decision. The expert shall select one Party's Proposed Agreement as his or her decision, and shall not have the authority to render any substantive decision other than to select the Proposed Agreement submitted by either GNE or Adaptive. The expert shall have no discretion or authority with respect to modifying the positions of the Parties. The expert's decision shall be final and binding on the Parties and the written agreement selected by the expert shall constitute a binding agreement between the Parties that may be enforced in accordance with its terms. Each Party shall bear its own costs and expenses in connection with such arbitration, and shall share equally the expert's fees and expenses;

(h) The violation of one of the time limits prescribed in this Section 16.6.3 by the expert shall not affect the expert's competence to decide on the subject matter, and shall not affect the final and binding decision rendered by the expert, unless otherwise agreed by the Parties; and

(i) the above "baseball-style" arbitration shall be the exclusive remedy of either Party if the Parties cannot agree on the terms of the Reversion TCR License under this Section 16.6.3.

ARTICLE 17
HSR FILING; TERMINATION UPON HSR DENIAL

If GNE determines that an HSR Filing is necessary, each Party shall, comply promptly but in no event later than [***] business days of the Execution Date (or such later time as may

be agreed to in writing by the Parties), file with the United States Federal Trade Commission and the Antitrust Division of the United States Department of Justice, and/or with equivalent foreign authorities, any HSR Filing required of it under the HSR Act or applicable antitrust or competition laws of other jurisdictions with respect to the transactions contemplated hereby. The Parties shall seek expedited treatment of any HSR Filing unless otherwise agreed by the Parties in writing. Each Party will use reasonable efforts to do, or cause to be done, all things necessary or advisable to, as promptly as practicable, take all actions necessary to make the filings required of such Party or its Affiliates under the HSR Act and obtain the requisite Governmental Required Consents. The Parties shall cooperate with one another to the extent necessary in the preparation of any such HSR Filing. Each Party shall be responsible for its own costs, expenses, and filing fees associated with any HSR Filing. If the Parties make an HSR Filing under this Agreement, then this Agreement shall terminate: (a) at the election of either Party, immediately upon written notice to the other Party, if the U.S. Federal Trade Commission or the U.S. Department of Justice, or an equivalent authority in the European Union, seeks a preliminary injunction under the applicable antitrust laws against the Parties to enjoin the transactions contemplated by this Agreement; or (b) at the election of either Party, immediately upon written notice to the other Party, in the event that the HSR Clearance Date shall not have occurred on or prior to [***] days after the effective date of the HSR Filing. In the event of such termination, this Agreement shall be of no further force and effect.

ARTICLE 18
DISPUTE RESOLUTION

18.1 **Disputes**. Adaptive and GNE recognize that a dispute, controversy or claim of any nature whatsoever arising out of or relating to this Agreement, or the breach, termination or invalidity thereof, (each, a "**Dispute**") may from time to time arise during the Term. Unless otherwise specifically recited in this Agreement, such Disputes between Adaptive and GNE will be resolved as recited in this ARTICLE 18. In the event of the occurrence of such a Dispute, the Parties shall first refer such Dispute to their respective Alliance Managers for attempted resolution by such Alliance Managers within [***] days after such referral. If such Dispute is not resolved within such [***] day period by the Alliance Managers, either Adaptive and GNE may, by written notice to the other, have such Dispute referred to their respective officers designated below (or their designees who have been duly authorized to resolve such Dispute), for attempted resolution within [***] days after such notice is received. Such designated officers are as follows:

For GNE – [***]

For Adaptive – [***]

In the event the designated officers, or their respective designees, are not able to resolve such Dispute within [***] days of receipt of the written notice referring such Dispute to such designated officers, then either Party may initiate the dispute resolution procedures set forth in Section 18.2.

18.2 **Arbitration**.

18.2.1 **Rules**. Except as otherwise expressly provided in this Agreement (including under Section 18.3), the Parties agree that any Dispute not resolved internally by the Parties pursuant to Section 18.1 shall be resolved through final and binding arbitration administered by JAMS in accordance with its Comprehensive Arbitration Rules and Procedures (the "**Rules**"), except as modified in this Agreement, applying the substantive law specified in Section 19.1.

18.2.2 **Arbitrators; Location**. Each Party shall select [***], and the [***] arbitrators so selected shall choose a [***] arbitrator. All [***] arbitrators shall serve as neutrals and have at least ten (10) years of: (a) dispute resolution experience (including judicial experience) and/or (b) legal or business experience in the biotech or pharmaceutical industry. If a Party fails to nominate its arbitrator, or if the Parties' arbitrators cannot agree on the third, the necessary appointments shall be made in accordance with the Rules. Once appointed by a Party, such Party shall have no *ex parte* communication with its appointed arbitrator, other than as permitted by Rule 14(b) of the Rules. The arbitration proceedings shall be conducted in New York, New York, USA. The arbitration proceedings and all pleadings and written evidence shall be in the English language. Any written evidence originally in another language shall be submitted in English translation accompanied by the original or a true copy thereof.

18.2.3 **Procedures; Awards**. Each Party agrees to use reasonable efforts to make all of its current employees available, if reasonably needed, and agrees that the arbitrators may determine any person as necessary. The arbitrators shall be instructed to render a written, binding, non-appealable resolution and award on each issue that clearly states the basis upon which such resolution and award is made. The written resolution and award shall be delivered to the Parties as expeditiously as possible, but in no event more than [***] days after conclusion of the hearing, unless otherwise agreed by the Parties. Judgment upon such award may be entered in any competent court or application may be made to any competent court for judicial acceptance of such an award and order for enforcement. Each Party agrees that, notwithstanding any provision of applicable law or of this Agreement, it will not request, and the arbitrators shall have no authority to award, punitive or exemplary damages against any Party.

18.2.4 **Costs**. The prevailing Party, as determined by the arbitrators, shall be entitled to: (a) its share of fees and expenses of the arbitrators; and (b) its reasonable attorneys' fees and associated costs and expenses. In determining which Party "prevailed," the arbitrators shall consider: (i) the significance, including the financial impact, of the claims prevailed upon; and (ii) the scope of claims prevailed upon, in comparison to the total scope of the claims at issue. If the arbitrators determine that, given the scope of the arbitration, neither Party "prevailed," the arbitrators shall order that the Parties: (A) share equally the fees and expenses of the arbitrators; and (B) bear their own attorneys' fees and associated costs and expenses.

18.2.5 **Interim Equitable Relief**. Notwithstanding anything to the contrary in this Section 18.2, either Party may seek a temporary injunction or other interim equitable relief in a court of competent jurisdiction pending the ability of the arbitrators to review the decision under this Section 18.2. Such court shall have no jurisdiction or ability to resolve Disputes beyond the specific issue of temporary injunction or other interim equitable relief.

18.2.6 **Protective Orders; Arbitrability**. At the request of either Party, the arbitrators shall enter an appropriate protective order to maintain the confidentiality of information produced or exchanged in the course of the arbitration proceedings. The arbitrators shall have the power to decide all questions of arbitrability.

18.3 **Subject Matter Exclusions**. Notwithstanding the provisions of Section 18.2, any Dispute not resolved internally by the Parties pursuant to Section 18.1 that involves the validity or infringement of a Patent included in a license granted in this Agreement that is issued in: (a) the United States shall be subject to actions before the United States Patent and Trademark Office and/or submitted exclusively to the federal court located in the jurisdiction of the district where any of the defendants resides; and (b) any other country (or region) shall be brought before an appropriate regulatory or administrative body or court in that country (or region), and the Parties hereby consent to the jurisdiction and venue of such courts and bodies.

18.4 **Continued Performance**. *Provided*, that this Agreement has not terminated, the Parties agree to continue performing under this Agreement in accordance with its provisions, pending the final resolution of any Dispute.

ARTICLE 19
MISCELLANEOUS

19.1 **Applicable Law**. This Agreement (including the arbitration provisions of Section 18.2) shall be governed by and interpreted in accordance with the laws of the State of New York, without reference to the principles of conflicts of laws. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to the transactions contemplated by this Agreement.

19.2 **Notices**. Except as otherwise expressly provided in the Agreement, any notice required under this Agreement shall be in writing and shall specifically refer to this Agreement. Notices shall be sent via one of the following means and will be effective: (a) on the date of delivery, if delivered in person; (b) on the date of receipt, if sent by a facsimile (with delivery confirmed); or (c) on the date of receipt, if sent by private express courier or by first class certified mail, return receipt requested. Any notice sent via facsimile shall be followed by a copy of such notice by private express courier or by first class mail. Notices shall be sent to the other Party at the addresses set forth below. Either Party may change its addresses for purposes of this Section 19.2 by sending written notice to the other Party.

If to GNE:

Genentech, Inc.
Attn: Corporate Secretary
1 DNA Way
South San Francisco, CA 94080 USA.
Fax: [***]
Phone: [***]

with required copies (which shall not constitute notice) to:

Genentech, Inc.
Attn: Vice President, Genentech Partnering
1 DNA Way
South San Francisco, CA 94080 USA
Fax: [***]
[***]

If to Adaptive:

Adaptive Biotechnologies
Attn: CEO
1551 Eastlake Ave. East, Suite 200
Seattle, WA 98102

with required copies (which shall not constitute notice) to:

Adaptive Biotechnologies
Legal Department
1551 Eastlake Ave. East, Suite 200
Seattle, WA 98102

19.3 **Assignment**. Neither Party may assign or otherwise transfer, in whole or in part, this Agreement without the prior written consent of the non-assigning Party, such approval not to be unreasonably withheld or delayed. Notwithstanding the foregoing, either Party may assign this Agreement to: (a) an Affiliate; or (b) any purchaser of all or substantially all of the assets of such Party (and in such event this Agreement must be assigned to such purchaser), or of all of its capital stock, or to any successor corporation or entity resulting from any merger or consolidation of such Party with or into such corporation or entity (whether arising under contract, by statute or at law), or otherwise in connection with a Change of Control of such Party; *provided*, that the party to which this Agreement is assigned expressly agrees in writing to assume and be bound by all obligations of the assigning Party under this Agreement. A copy of such written agreement by such assignee shall be provided to the non-assigning Party within [***] calendar days of execution of such written agreement. Subject to the foregoing, this Agreement will benefit and bind the Parties' successors and assigns.

19.4 **Independent Contractors**. The Parties hereto are independent contractors and nothing contained in this Agreement shall be deemed or construed to create a partnership, joint venture, employment, franchise, agency or fiduciary relationship between the Parties.

19.5 **Integration**. Except to the extent expressly provided herein, this Agreement constitutes the entire agreement between the Parties relating to the subject matter of this Agreement and supersedes all previous oral and written communications between the Parties with respect to the subject matter of this Agreement (including the Non-Disclosure Agreement and term sheets exchanged by and between Adaptive and GNE).

19.6 **Amendment; Waiver**. Except as otherwise expressly provided herein, no alteration of or modification to this Agreement shall be effective unless made in writing and executed by an authorized representative of both Parties. No course of dealing or failing of either Party to strictly

enforce any term, right or condition of this Agreement in any instance shall be construed as a general waiver or relinquishment of such term, right or condition. The observance of any provision of this Agreement may be waived (either generally or in any given instance and either retroactively or prospectively) only with the written consent of the Party granting such waiver.

19.7 **Further Assurance**. Each Party shall and shall use all reasonable endeavors to procure that any necessary Third Party shall promptly execute and deliver such further documents and do such further acts as may be required for the purpose of giving full effect to this Agreement.

19.8 **Severability**. The Parties do not intend to violate any public policy or statutory or common law. However, if any sentence, paragraph, clause or combination or part thereof of this Agreement is in violation of any law or is found to be otherwise unenforceable, such sentence, paragraph, clause or combination or part of the same shall be deleted and the remainder of this Agreement shall remain binding, *provided*, that such deletion does not alter the basic purpose and structure of this Agreement.

19.9 **No Third Party Rights**. The Parties do not intend that any term of this Agreement should be enforceable by any person who is not a Party.

19.10 **Construction**. The Parties mutually acknowledge that they and their attorneys have participated in the negotiation and preparation of this Agreement. Ambiguities, if any, in this Agreement shall not be construed against any Party, irrespective of which Party may be deemed to have drafted this Agreement or authorized the ambiguous provision.

19.11 **Interpretation**. The captions and headings to this Agreement are for convenience only, and are to be of no force or effect in construing or interpreting any of the provisions of this Agreement. Unless context otherwise clearly requires, whenever used in this Agreement: (a) the words “include” or “including” shall be construed as incorporating “but not limited to” or “without limitation”; (b) the words “hereof,” “herein,” “hereby” and derivative or similar words refer to this Agreement, including the Exhibits; (c) the word “law” or “laws” means any applicable, legally binding statute, ordinance, resolution, regulation, code, guideline, rule, order, decree, judgment, injunction, mandate or other legally binding requirement of a governmental authority (including a court, tribunal, agency, legislative body or other instrumentality of any: (i) government or country or territory; (ii) any state, province, county, city or other political subdivision thereof; or (iii) any supranational body); (d) all references to the word “will” are interchangeable with the word “shall” and shall be understood to be imperative or mandatory in nature; (e) all references to “sublicensees” shall include all sublicensees of sublicensees through multiple tiers of sublicensing; (f) the singular shall include the plural and vice versa; and (g) the word “or” has the inclusive meaning represented by the phrase “and/or”. All references to days, months, quarters or years are references to calendar days, calendar months, calendar quarters, or calendar years. Whenever any matter hereunder requires consent or approval, such consent shall not be unreasonably withheld or delayed.

19.12 **Counterparts**. This Agreement may be executed in two or more counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument. For purposes hereof, a facsimile copy, or email with attached pdf copy, of this Agreement, including the signature pages hereto, will be deemed to be an original. Notwithstanding the foregoing, the Parties shall deliver original execution copies of this Agreement to one another as soon as practicable following execution thereof.

[Signature page follows – the rest of this page intentionally left blank.]

IN WITNESS WHEREOF, Adaptive and GNE have executed this Agreement by their respective officers hereunto duly authorized, on the Execution Date.

ADAPTIVE BIOTECHNOLOGIES CORPORATION

By: /s/Chad Robins

Name: Chad Robins

Title: CEO and Co-founder

GENETECH, INC.

By: /s/Edward Harrington

Name: Edward Harrington

Title: CFO, Genetech

EXHIBIT 1.8
Adaptive Platform

[***]

Certain information, as identified by [***], has been excluded from this agreement because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

Exhibit 1.159
TruTCR Criteria

[***]

Certain information, as identified by [***], has been excluded from this agreement because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

EXHIBIT 2.2.2(d)
TCR Sequencing Plan Requirements

[***]

Certain information, as identified by [***], has been excluded from this agreement because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

EXHIBIT 3.2
Research Plan

[***]

Certain information, as identified by [***], has been excluded from this agreement because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

EXHIBIT 3.4
Approved Subcontractors

Subcontractor Name	Item Description
[***]	[***]
[***]	[***]
[***]	[***]
[***]	[***]
[***]	[***]

Certain information, as identified by [***], has been excluded from this agreement because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

EXHIBIT 4.2
Development Plan Overview

[***]

Certain information, as identified by [***], has been excluded from this agreement because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

EXHIBIT 4.3
Approved Development Subcontractors

To be agreed upon the commencement of Development activities.

EXHIBIT 7.4
Adaptive Screening Technology Transfer

If Adaptive is required by this Agreement or the TCR Sequence Supply Agreement to make a transfer of any of the Adaptive Platform technology to a GNE facility and/or a facility of a GNE Third Party contract manufacturer (the "**Screening Contract Manufacturer**") to enable either GNE and/or the Screening Contract Manufacturer to conduct the TCR, screening, selection, sequencing, and/or pairing elements of the Adaptive Platform in order to manufacture a Private Antigen TCR Product (a "**Screening Technology Transfer**" and the Adaptive Confidential Information and Adaptive Know-How to be transferred in any Screening Technology Transfer the "**Screening Technology**"), then the following provisions shall be applicable, unless otherwise agreed in the TCR Sequence Supply Agreement.

(a) GNE shall provide written notice to Adaptive of the need for the Screening Technology Transfer and the location of the facility to which GNE proposes the Screening Technology be transferred, which may be either a GNE facility or the facility of a Screening Contract Manufacturer.

(b) If the proposed Screening Technology Transfer is to a Screening Contract Manufacturer, then such Screening Contract Manufacturer shall be subject to the reasonable approval of Adaptive, not to be unreasonably withheld, conditioned or delayed. If Adaptive declines to approve a Screening Contract Manufacturer proposed by GNE, then GNE shall have the right to propose one or more additional Screening Contract Manufacturers for Adaptive's approval, such approval not to be unreasonably withheld, conditioned or delayed (and in any event not delayed more than [***] days).

(c) The Screening Technology Transfer shall be accomplished as promptly as practicable, and in any event the Parties shall use their respective best efforts to complete it within [***] days following full execution of the Screening Technology Transfer Agreement, unless otherwise mutually agreed by the Parties.

If the proposed Screening Technology Transfer is to a Screening Contract Manufacturer proposed by GNE and approved by Adaptive as provided above, then prior to Adaptive undertaking any Screening Technology Transfer, and prior to the disclosure of any Screening Technology Transfer to the Screening Contract Manufacturer, Adaptive and the Screening Contract Manufacturer shall enter into an Screening Technology Transfer agreement reasonably satisfactory in form and content to Adaptive ("**Screening Technology Transfer Agreement**"). In the Screening Technology Transfer Agreement, the Screening Contract Manufacturer shall agree that the Screening Technology will be transferred by Adaptive to the Screening Contract Manufacturer pursuant to the terms and conditions of the Screening Technology Transfer Agreement. In the Screening Technology Transfer Agreement, the Screening Contract Manufacturer shall agree to usual and customary terms observed in the US pharmaceutical industry for the protection of commercially valuable know-how, including the following: (i) to maintain the confidentiality of the Screening Technology, and to use the Screening Technology solely for the purpose of screening TCRs for the manufacture of Private Antigen TCR Product and supplying the resultant TCRs to GNE; (ii) not to misappropriate, or make any other unauthorized use or disclosure of the Screening Technology; and (iii) that the misappropriation or other unauthorized use or disclosure of the Screening Technology (any use other than for the purpose specified above) will be a material breach of Screening Technology Transfer Agreement and will cause irreparable harm to Adaptive not compensable by monetary damages, and that Adaptive will have the right to seek and obtain an injunction or other similar equitable remedy against the Screening Contract Manufacturer for any breach by the Screening Contract Manufacturer of its obligations relating to the use or confidentiality of the Screening Technology, without the necessity for Adaptive to post a bond.

Certain information has been excluded from this exhibit because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

EXECUTION VERSION

MICROSOFT ARTIFICIAL INTELLIGENCE & RESEARCH GROUP

STRATEGIC COLLABORATION AGREEMENT

This Strategic Collaboration Agreement (this "**Agreement**") is made and entered into as of the last signature date written below (the "**Effective Date**") by and between Microsoft Corporation, a Washington corporation having its principal place of business at One Microsoft Way, Redmond, Washington, USA 98052 ("**Microsoft**") and Adaptive Biotechnologies Corporation, a company having its principal place of business at 1551 Eastlake Ave E, Seattle, WA 98102 ("**Adaptive**"). Microsoft and Adaptive are sometimes referred to in this Agreement individually as a "**Party**" and collectively as the "**Parties**."

BACKGROUND

A. Adaptive is a biotechnology industry pioneer and leader that focuses on combining high-throughput sequencing and expert bioinformatics capabilities to profile T-cell and B-cell receptors. Adaptive owns or has access to data that can be used to computationally derive T-cell receptor-antigen mappings.

B. Microsoft is a worldwide technology company that develops, sells and otherwise makes available a wide variety of software applications, cloud services, machine learning technologies, and other products that affect the life sciences and healthcare industries.

C. Adaptive and Microsoft desire to set forth the terms on which they intend to pursue their shared goal of computationally deriving T-cell receptor ("**TCR**") to antigen mappings in order to create a comprehensive map for purposes of developing biological research, diagnostic or therapeutic applications (the "**Project**"). The Parties' vision is that their collaboration will ultimately enable them to develop a universal diagnostic based on a single blood draw and TCR sequencing.

D. To pursue the goals described above, Microsoft intends to provide reasonable machine learning, software and cloud services development support, including making Microsoft Research personnel with computational and machine learning domain expertise reasonably available to work with Adaptive on the collaboration project, and to develop the Immunomics AI Services (as defined in this Agreement), at no charge to Adaptive, in order to carry out activities under the Development Plan (as defined in this Agreement).

E. To pursue the goals described above, Adaptive intends to provide data and immunomics, diagnostic and bioinformatics expertise, at no charge to Microsoft, in order to carry out activities under the Development Plan.

F. Adaptive also intends, after a reasonable transition period and subject to the further terms and conditions set forth in this Agreement, to use Microsoft's Azure cloud services to host all of its existing and new activities that are hosted on a public cloud service. Adaptive and Microsoft are entering into a commercial agreement regarding Adaptive's use of Azure concurrently with this Agreement.

AGREEMENT

In consideration of the terms of this Agreement and other good and valuable consideration, the sufficiency of which is acknowledged, the Parties agree as follows:

1. DEFINITIONS. The definitions of terms used in initially capitalized form in this Agreement are set forth in **Exhibit A** or elsewhere in this Agreement.

2. DEVELOPMENT EFFORT.

2.1 Development Plan. The Parties have mutually agreed on the initial Development Plan incorporated in this Agreement as **Exhibit B.** The Parties' Project Managers will review the Development Plan periodically, and upon mutual written agreement of the Parties' Relationship Managers, the Parties may update the Development Plan to reflect the evolution of activities under the then-current Development Plan and add details regarding upcoming activities they intend to carry out under the Collaboration; provided, however, that in the event any such update to the Development Plan has the effect of amending, modifying or supplementing the terms of this Agreement, such update to the Development Plan must be approved in accordance with Section 12.12.

2.2 Good Faith Efforts to Carry Out Development Plan. The Parties will act in good faith during the Development Term to carry out the activities described in the Development Plan in accordance with the timelines it sets forth. Without limiting the foregoing, each Party will act in good faith to develop, procure and make available the technologies, data and/or other project components for which it is responsible under the Development Plan.

3. PROJECT MANAGEMENT AND RELATIONSHIP MANAGEMENT

3.1 Project Management. Each Party will designate an individual to act as its project manager ("**Project Manager**") with respect to the Collaboration and coordinate that Party's activities under the Development Plan. The Parties' Project Managers will schedule and conduct regular meetings to discuss the status of the activities under the Development Plan. Without limiting the foregoing, the Project Managers will:

(a) review the Development Plan at least once every calendar quarter during the Development Term, and more frequently if requested by either Party;

(b) recommend changes in the Development Plan as may be desirable to reflect any changes in the scope, objectives, tasks, responsibilities of each Party, schedule, or other aspects of the Collaboration;

(c) coordinate the review and approval process regarding any publicity activities, publications or other communications regarding the Collaboration; and

(d) prepare written reports on the status of activities under the Development Plan for review by the Relationship Managers at least once during each calendar quarter and more frequently if requested by either Party.

3.2. Relationship Management. Each Party will designate an individual to serve as that Party's overall relationship manager for purposes of the Collaboration (each, a "**Relationship Manager**"). As of the Effective Date, the Relationship Managers are the individuals designated to perform such role in **Exhibit C**. Either Party may replace its Relationship Manager upon written notice to the other Party.

3.3 GTM Discussions. The Relationship Managers will meet at least twice per calendar year during the Development Term, or as otherwise mutually agreed, to discuss go to market ("**GTM**") strategies applicable to products or services that result from the Collaboration. Adaptive will provide Microsoft with information about GTM strategies that Adaptive is considering in advance of execution of such strategies and will provide Microsoft an equitable opportunity to provide input to and participate in the development and execution of such GTM strategies; provided, however, that Adaptive will have the sole and exclusive right to make final determinations regarding GTM strategies. For clarity, the foregoing proviso does not modify or supersede any of the license terms or conditions set forth in this Agreement.

3.4 Dispute Resolution. The Parties will endeavor to resolve any dispute that arises under this Agreement by using the escalation procedures set forth in Exhibit C, subject to the exceptions described in Exhibit C.

4. OWNERSHIP OF PROJECT MATERIALS, COLLABORATION OUTPUTS AND RELATED PROPRIETARY RIGHTS

4.1 Project Materials and Background Rights. Each Party owns and will retain all ownership rights in all Project Materials such Party uses or makes available for use in the Collaboration. Each Party also owns and will retain all ownership rights in such Party's Background Non-Patent IP and Background Inventions.

4.2 Outputs of the Collaboration.

(a) Adaptive will own (i) all Adaptive's Outputs, (ii) all Foreground Non-Patent IP embodied or implemented in Adaptive's Outputs, (iii) all Adaptive Foreground Inventions, and (iv) all Joint Foreground Inventions and Microsoft Foreground Inventions that (in each case) read on Adaptive's Outputs or Microsoft's Outputs.

(b) Microsoft will own (i) all Microsoft's Outputs, and (ii) all Foreground Non-Patent IP embodied or implemented in Microsoft's Outputs.

4.3 Assignments of Rights.

(a) Pursuant to Section 4.2(a), Microsoft hereby assigns and agrees to assign to Adaptive (i) all of Microsoft's rights in any Foreground Non-Patent IP embodied or implemented in Adaptive's Outputs, (ii) all Microsoft Foreground Inventions that read on Adaptive's Outputs or Microsoft's Outputs, and (iii) all Microsoft Patent Rights in Joint Foreground Inventions that read on Adaptive's Outputs or Microsoft's Outputs.

(b) Pursuant to Section 4.2(b), Adaptive hereby assigns and agrees to assign to Microsoft all of Adaptive's rights in any Foreground Non-Patent IP embodied or implemented in Microsoft's Outputs.

(c) Each Party will take all necessary steps, at such Party's expense, to execute and deliver any instruments and take any other actions reasonably requested by the other Party to perfect the assignments of Non-Patent IP and Patent Rights contemplated by Sections 4.3(a) and (b), as applicable.

(d) For clarity, the assignments contemplated by this Section 4.3 are limited to the Foreground Non-Patent IP and Foreground Patent Rights expressly specified in Sections 4.3(a) and (b), as applicable. Assignments under this Section 4.3 do not and will not include any other Non-Patent IP or Patent Rights of the assigning Party, including without limitation in such Party's Background Non-Patent IP and Background Inventions, even if these are included in or necessary for the assignee's exploitation of Microsoft's Outputs or Adaptive's Outputs, as applicable.

(e) Adaptive will be responsible for, and will have the sole and exclusive right to make final determinations regarding, the maintenance and prosecution of Microsoft Foreground Inventions and Joint Foreground Inventions assigned to Adaptive under Section 4.3(a), but Adaptive will consider Microsoft's input regarding such maintenance and prosecution activities. Microsoft will provide such non-monetary assistance as Adaptive may reasonably request in connection with Adaptive's preparing, filing, and prosecuting applications for Microsoft Foreground Inventions and Joint Foreground Inventions assigned to it under Section 4.3(a).

(f) Neither Party will transfer to or grant to any Third Party any ownership of or rights or licenses in any Foreground Inventions or Foreground Non-Patent IP owned by that Party that prevent the other Party from practicing license rights granted to it under this Agreement or interfere with the other Party's ability to fully exercise any such license rights.

5. LICENSE GRANTS

5.1 Development Plan Activities. Each Party hereby grants to the other Party a non-exclusive, non-sublicensable, non-transferable (except as set forth in Section 12.2), worldwide, royalty-free, fully paid license under all of the granting Party's Non-Patent IP and Patent Rights to exercise all rights necessary to carry activities under the Development Plan during the Development Term.

5.2 Microsoft Licenses to Adaptive. Microsoft hereby grants to Adaptive:

(a) (i) An exclusive, perpetual, non-transferable (except as set forth in Section 12.2), irrevocable, worldwide, royalty free, full paid license, under Microsoft's Foreground Non-Patent IP, for Adaptive's internal research and development and to Commercialize Adaptive's Outputs and Adaptive Offerings that use the Immunomics AI Services, all solely within the Field of Use; (ii) an exclusive, perpetual, non-transferable (except as set forth in Section 12.2), irrevocable, worldwide, royalty free, full paid license, under Microsoft's Foreground Non-Patent IP, for Adaptive's internal research and development and to Commercialize Adaptive's Outputs and Adaptive Offerings that use Algorithms, all solely within the Project; and (iii) a non-exclusive, perpetual, non-transferable (except as set forth in Section 12.2), irrevocable, worldwide, royalty free, full paid license, under Microsoft's Foreground Non-Patent IP, for Adaptive's internal research and development and to Commercialize Adaptive's Outputs and Adaptive Offerings that use Algorithms, all solely within the Field of Use outside of the Project;

(b) A non-exclusive, perpetual, non-transferable (except as set forth in Section 12.2), irrevocable, worldwide, royalty free, fully paid license, under Microsoft's Background Non-Patent IP, for Adaptive's internal research and development and to Commercialize Adaptive's Outputs and Adaptive Offerings that use Microsoft's Outputs, all solely within the Field of Use; and

(c) A non-exclusive, perpetual, non-transferable (except as set forth in Section 12.2), irrevocable, worldwide, royalty free, fully paid license, under Microsoft's Background Inventions that are necessarily infringed by Microsoft's Outputs, for Adaptive's internal research and development and to Sell Adaptive's Outputs and Adaptive Offerings that use Microsoft's Outputs, all solely within the Field of Use.

5.3 Adaptive Licenses to Microsoft. Adaptive hereby grants to Microsoft and its Affiliates:

(a) An exclusive, perpetual, non-transferable (except as set forth in Section 12.2), irrevocable, worldwide, royalty free, fully paid license, under Adaptive's Foreground Non-Patent IP, to Commercialize Microsoft's Outputs as part of any and all Microsoft Offerings, all solely outside the Field of Use;

(b) (i) An exclusive, perpetual, non-transferable (except as set forth in Section 12.2), irrevocable, worldwide, royalty free, fully paid license, under Adaptive Foreground Inventions, Joint Foreground Inventions and Microsoft Foreground Inventions, to Sell Microsoft's Outputs as part of any and all Microsoft Offerings, all solely outside the Field of Use; and (ii) a non-exclusive, perpetual, nontransferable (except as set forth in Section 12.2), irrevocable, worldwide, royalty free, fully paid license, under Adaptive Foreground Inventions, Joint Foreground Inventions and Microsoft Foreground Inventions, to Sell Algorithms as part of any and all Microsoft Offerings, all solely within the Field of Use outside the Project.

(c) A non-exclusive, perpetual, non-transferable (except as set forth in Section 12.2), irrevocable, worldwide, royalty free, fully paid license, under Adaptive's Background Non-Patent IP, to Commercialize Microsoft Outputs as part of any and all Microsoft Offerings, all solely outside the Field of Use;

(d) A non-exclusive, perpetual, non-transferable (except as set forth in Section 12.2), irrevocable, worldwide, royalty free, fully paid license, under Adaptive Background Inventions that are necessarily infringed by Microsoft's Outputs, to Sell Microsoft Outputs as part of any and all Microsoft Offerings, all solely outside the Field of Use; and

(e) A non-exclusive, perpetual, non-transferable (except as set forth in Section 12.2), irrevocable, worldwide, royalty free, fully paid license, under all Joint Foreground Inventions and Microsoft Foreground Inventions, for Microsoft's internal research purposes only (including research within the Field of Use); provided, however, that such internal research may not be conducted in collaboration with any Third Party on any research substantially similar to the Project or used to assist any Third Party Commercialization of any Offerings for purposes or with the effect of circumventing Adaptive's rights under Sections 4 and 5 or in any manner that would not comply with Section 6.5; and provided further that following the Development Term, the foregoing license may not be used by Microsoft for research substantially similar to the Project.

5.4 Modified and New License Grants Arising from Certain Circumstances. Upon consummation of a Corporate Event in which [***] or any Affiliate of the foregoing is the counter-party:

(a) the exclusive licenses granted by Microsoft under Section 5.2(a)(i) and (ii) will automatically become non-exclusive (and, for clarity, this license will remain limited to the Field of Use);

(b) Adaptive will automatically be deemed to grant to Microsoft and its Affiliates a nonexclusive, perpetual, non-transferable (except as set forth in Section 12.2), irrevocable, worldwide, fully paid, royalty free, fully paid up, license (i) under Adaptive's Foreground Non-Patent IP and Adaptive's Background Non-Patent IP, to Commercialize the Computational Models as part of any and all Microsoft Offerings (i.e., whether or not in the Field of Use), and (ii) under Adaptive Foreground Inventions, Joint Foreground Inventions, Microsoft Foreground Inventions, and Adaptive Background Inventions, to Sell the Computational Models as part of any and all Microsoft Offerings (i.e., whether or not in the Field of Use); and

(c) The limitations regarding Microsoft research activities after the Development Term in the final clause of Section 5.3(e) will no longer apply.

Certain information, as identified by [***], has been excluded from this agreement because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

5.5 Enforcement Rights under Exclusive Licenses. The exclusive licenses granted to each Party under this Agreement will provide the licensed Party with an exclusive right to enforce the licensed rights within the scope of its exclusive licenses against infringers at its own cost and expense, and the Party that is the licensor agrees to join enforcement actions (at the licensed Party's expense) if the licensor Party is a necessary party to bring such an action.

5.6 Protection of Licenses in Bankruptcy. The Non-Patent IP and Patent Rights referenced in Section 4 are intellectual property, and the licenses granted in this Section 5 are licenses to intellectual property, under the Bankruptcy Law. In the event of any proceeding for the bankruptcy, reorganization, or protection of either Party or any of their Affiliates under any applicable Bankruptcy Law, the licenses granted under this Section 5 will be subject to Section 365(n) of the United States Bankruptcy Code and any corresponding or similar provision for the protection of licensees of intellectual property under any other Bankruptcy Laws. If any debtor-in-possession, trustee, or similar authority rejects, cancels, or similarly acts with respect to this Agreement under any applicable Bankruptcy Law, the licensed Party may elect to retain its rights under the applicable license terms in this Section 5 as provided for in Section 365(n) of the United States Bankruptcy Code or any corresponding or similar provision under any other applicable Bankruptcy Law.

5.7 Reservations of Rights. Except to the extent expressly set forth in this Agreement, this Agreement does not assign, grant or otherwise transfer, whether by implication, estoppel or otherwise, any license or other right in, to or under any Non-Patent IP or Patent Rights of either Party. All rights not expressly granted in this Agreement are reserved. Without limiting the generality of the foregoing:

(a) except for the licenses in Section 5, and the assignments in Section 4, each Party reserves all of its right, title and interest in and to its Project Materials, Non-Patent IP and Patent Rights;

(b) Nothing contained in this Agreement will be construed as:

(i) a warranty or representation by either Party as to the validity, enforceability, and/or scope of any Patent Rights or Non-Patent IP; or

(ii) imposing upon either Party any obligation to institute any suit or action for infringement of any Patent or Non-Patent IP, or to defend any suit or action brought by a Third Party against such Party which challenges or concerns the validity, enforceability, or scope of any Patent or Non-Patent IP; and

(c) except as may be expressly agreed upon by the Parties with respect to any press release or other publicity activities conducted pursuant to Section 7.3, neither Party grants any license or other right in or to any of its Trademarks under this Agreement, and neither Party will use any Trademark of the other Party in any publicity, advertising or other promotional activities without the prior written consent of such other Party, provided that the foregoing does not restrict any right that either Party may have under Applicable Laws to make accurate, descriptive and nominative references to the other Party's Trademarks.

6. EXCLUSIVITY AND CLOUD SERVICES COMMITMENTS

6.1 Azure Commercial Agreement. Following the Parties' entry into this Agreement, Microsoft and Adaptive plan to enter into separate commercial agreements regarding Adaptive's purchase of Azure Services (the "**Commercial Agreement**"), which include standard volume pricing terms and a minimum Azure consumption requirement. Nothing in this Agreement will be deemed to modify or supersede the terms of the Commercial Agreement.

6.2 Exclusive Use of Azure. Adaptive agrees that throughout the Development Term and, if longer, until the seven (7) year anniversary of the Effective Date, all Collaboration activities that use a cloud service (including the Immunomics AI Services) will use Azure exclusively, subject to Adaptive's right to terminate the Commercial Agreement for breach or non-performance as set forth in the Commercial Agreement. In addition, Adaptive agrees to ensure that on a reasonably expedient schedule, and in any event within no more than eighteen (18) months after the Effective Date, all activities for which Adaptive uses any cloud (or "hosted") service, including both new and ongoing Adaptive activities that use a cloud service (regardless of whether such activities are related to the Collaboration), will use Azure exclusively, subject to Adaptive's right to terminate the Commercial Agreement for breach or nonperformance as set forth in the Commercial Agreement. Accordingly, Adaptive will wind down any existing agreements it may have with other cloud service providers within eighteen (18) months after the Effective Date. Notwithstanding anything to the contrary in this paragraph, (a) Adaptive's obligation to use Azure exclusively does not apply to applications or services that Adaptive acquires from Third Parties for which the Third Party provider controls selection of the cloud services provider that hosts such application or service (e.g., Salesforce or MerrillEdge applications or services) and (b) in the event that Adaptive acquires another entity or the assets thereof, whether by merger, purchase of equity or assets or otherwise, Adaptive shall have a period of eighteen (18) months following the closing of such acquisition to wind down any existing agreements such other entity may have with other cloud service providers. Further, Adaptive will not, and will not authorize any Third Party to, promote, market or otherwise publicly discuss Adaptive's use of any Third Party cloud service provider to host any Adaptive Offering after the Effective Date.

6.3 Exclusive Use of Immunomics AI Services by Adaptive. Adaptive agrees that throughout the Development Term it (a) will use the Immunomics AI Services exclusively for TCR-antigen mapping in connection with any Adaptive Offering developed as a direct result of the Collaboration and for which use of services similar to the Immunomics AI Services is relevant and (b) will not sublicense its rights under Sections 4 and 5 hereof for the purpose of circumventing the foregoing clause (a). The Parties anticipate that the Immunomics AI Services will be relevant (and therefore Adaptive will use exclusively the Immunomics AI Services pursuant to the previous sentence) in connection with any diagnostic applications for one or a set of medical conditions developed as a direct result of the Collaboration ("**Diagnostic Products**"). The Parties anticipate that the Immunomics AI Services may also be relevant to some (but not the preponderance of) therapeutic applications for one or a set of medical conditions developed as a direct result of the Collaboration ("**Therapeutic Products**"), and that Adaptive will use the Immunomics AI Services exclusively in all relevant Therapeutic Products cases but that Adaptive will also make available Therapeutic Products that do not use the Immunomics AI Services or any similar services. Notwithstanding anything to the contrary in this Section 6.3, if Adaptive identifies alternative services that it reasonably determines would provide superior business or technical performance, as compared to the Immunomics AI Services, in connection with one or more Adaptive Offerings developed as a direct result of the Collaboration and for which such services are relevant, Adaptive may notify Microsoft in writing of the information and analysis on which Adaptive has based such a determination (an "**Alternative AI Service Notice**"). If Adaptive delivers an Alternative AI Service Notice to Microsoft, the Parties' Relationship Managers will promptly meet to discuss the information and analysis it contains and, if the Parties agree that Microsoft cannot reasonably cause the Immunomics AI Services to provide at least equivalent business and technical performance to the alternative services identified by Adaptive for the particular use identified in the Alternative AI Service Notice (the "**Target Use**"), within one hundred twenty (120) days (or such other time period as the Parties may agree is commercially reasonable), Adaptive may thereafter use alternative services in place of the Immunomics AI Services for the Target Use (as used by applicable Adaptive Offerings) notwithstanding the terms of this Section 6.3.

6.4 Exclusive Use of Azure for Diagnostic Products. Adaptive agrees to host each Diagnostic Product exclusively on Azure throughout the Development Term and the five (5) year period immediately following the Development Term, subject to Adaptive's right to terminate the Commercial Agreement for breach or non-performance as set forth in the Commercial Agreement.

6.5 Microsoft and Adaptive Business Exclusivity Commitments. Microsoft and Adaptive each agree that during the Development Term, neither such Party nor any of such Party's Affiliates will enter into any collaboration agreement or other arrangement, with any Third Party under which such Party or any of such Party's Affiliates agrees to provide custom services in support of any project that is substantially similar to the Project. For clarity, this paragraph does not limit either Party's right to enter into, maintain and perform in accordance with Ordinary Course Relationships with any and all Third Parties, including Third Parties that may be undertaking projects in mapping TCR-antigen associations, provided that each Party will not disclose or provide any of the other Party's Confidential Information to any Third Parties except in accordance with the NDA and the terms of Section 7 of this Agreement and provided further that such Ordinary Course Relationships are consistent with each Party's rights set forth in Sections 4 and 5 hereof. As used herein, "**Ordinary Course Relationships**" with respect to Microsoft means Microsoft's provision of on-premises software, Azure, Office 365 and other cloud services, and associated updates, upgrades, technical support, general research and consulting services (including in the fields of artificial intelligence and machine learning not substantially similar to the Project). Adaptive acknowledges that Microsoft has estimated that as of the Effective Date, it provides Offerings under Ordinary Course Relationships to more than 150,000 life sciences and health care entities. As used herein, "**Ordinary Course Relationships**" with respect to Adaptive means Adaptive's ordinary course agreements, licenses, arrangements and relationships with pharmaceutical companies, therapeutics companies, diagnostics companies, clinical laboratory companies, academic and research institutions and governmental bodies, agencies and institutions that are, in each case, not substantially similar to the Project.

7. CONFIDENTIALITY; PUBLICITY AND RELATED ACTIVITIES

7.1 Application of NDA. Subject to the license rights expressly set forth in this Agreement, any disclosures, information or documents made or shared between the Parties under this Agreement will be governed by the NDA. The terms of the NDA are incorporated in this Agreement by reference and will apply to all Confidential Information (as defined in the NDA) exchanged between the Parties in connection with this Agreement. In addition, the terms of, and any discussions or negotiations in connection with, this Agreement are Confidential Information for purposes of the NDA. In the event of any conflict between any provision of this Agreement and any provision of the NDA, the provision of this Agreement will control. If the NDA is terminated during the Development Term, it will nonetheless continue in effect for the purposes of this Agreement for the remainder of the Development Term and the survival period set forth in Section 11.5 below.

7.2 Data Privacy & Security. No Protected Health Information (as such term is defined in the Health Insurance Portability and Accountability Act of 1996), other than the Protected Health Information necessary for a Party to carry out the Collaboration, will be provided by a Party to the other Party under this Agreement. If Adaptive intends to makes any Protected Health Information available to Microsoft for use in the Collaboration, Adaptive will first notify Microsoft of such intent and provide documentation

of: (i) the source of the data, (ii) any required consents, approvals and authorizations necessary for Microsoft to have access to or use such Protected Health Information in the Collaboration, and (iii) any security, privacy, use restrictions or other requirements that would apply to Microsoft's access to or use of such Protected Health Information. Microsoft may elect to accept or not to accept receiving access to the proposed Protected Health Information following its review of such documentation. For clarity, Adaptive is not required to follow the advance notice process described in this paragraph in order to provide to Microsoft, for use in the Collaboration, anonymous sequencing data (which data must not include any data that could enable the sequencing data to be linked to Protected Health Information of a donor). Microsoft covenants and agrees that it will not store, process or otherwise take any action with respect to data under the Collaboration that causes Adaptive to be subject to the data privacy or data security laws of any jurisdiction other than the United States of America, without Adaptive's prior written consent.

7.3 Approval Required for Publicity Activities. Neither Party will: (a) issue any press release or make any public statement of any kind about or related to this Agreement or the Collaboration without the express prior written consent of the other Party; or (b) use the other Party's name or Trademark for any purpose without the other Party's written consent. Subject to the foregoing, the Parties intend to collaborate on publicity upon entering into this Agreement, including by cooperating to issue a jointly-approved announcement of the overall strategic intent of this Agreement that includes CEO-level quotes from each Party, and a statement by Adaptive that Azure is the exclusive cloud service that Adaptive plans to use for its scientific and commercial activities.

8. REPRESENTATIONS AND WARRANTIES

8.1 General. Each Party represents, warrants and covenants to the other Party that:

(a) It has all necessary rights, power and authority to enter into and perform under this Agreement in accordance with its terms;

(b) It has not granted, and will not grant, any rights to any Third Party that would conflict with the terms of this Agreement;

(c) It has not entered into, and will not enter into, any agreement that would conflict with the terms of this Agreement;

(d) the individual signing this Agreement on its behalf has authority to bind it to this Agreement: and

(e) Except as otherwise disclosed by Adaptive to Microsoft in the Disclosure Schedule, as defined in that certain Series F-1 Preferred Stock Purchase Agreement, of even date herewith, by and between Adaptive, Microsoft and the other parties thereto, it has no knowledge (and has not been notified) of any allegation (or facts that would support an allegation) of any infringement or misappropriation of any Third Party Non-Patent IP or Patent Rights by any Project Material that it contemplates providing for use in the Collaboration (either in its standalone form or in the use contemplated under this Agreement).

8.2 Compliance with Laws. In addition to the representations, warranties and covenants set forth in Section 8.1,

(a) each Party represents, warrants and covenants to the other Party that it will comply with all Applicable Laws in connection with its performance under this Agreement;

(b) without limiting the foregoing, Adaptive represents, warrants and covenants that (i) if it makes any personal data available for use in the Collaboration, including any individually identifiable health information, Adaptive will have obtained all consents, approvals, authorizations, permits and waivers required by Applicable Laws to make such personal data available for such use, and (ii) Adaptive's provision and use of personal data under this Agreement will in all cases be in accordance with all Applicable Laws; and

(c) without limiting the foregoing, Microsoft covenants and agrees that if Adaptive makes any Protected Health Information available for use in the Collaboration in accordance with Section 8.2(b), Microsoft will use such Protected Health Information in all cases in accordance with all Applicable Laws.

8.3 Warranty Disclaimer. EXCEPT FOR THE EXPRESS WARRANTIES SET FORTH IN THIS SECTION 8, EACH PARTY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

9. DEFENSE AND INDEMNIFICATION OF CLAIMS

9.1 Indemnification. Each Party (the "**Indemnifying Party**") will defend, indemnify and hold harmless the other Party, its Affiliates, and their respective successors, directors, officers, employees and agents (each as the "**Indemnified Party**") from and against all Claims to the extent that any such Claim is brought against the Indemnified Party and arises out of or relates to (a) any breach by the Indemnifying Party of any representation, warranty or covenant set forth in Section 8; or (b) the negligent or willful acts or omissions of the Indemnifying Party or its agents or contractors resulting in any bodily injury or death to any person or loss, disappearance or damage to tangible or intangible property.

9.2 Indemnification Procedures. Neither Party will have liability under Section 9.1 to the other Party to the comparative extent that Claims result from the negligent or willful acts of the other Party. As a condition of its rights under Section 9.1, the Indemnified Party will provide the Indemnifying Party with reasonably prompt notice of an indemnifiable Claim under this Section 9; permit the Indemnifying Party to solely control the defense and settlement of the Claim; and provide the Indemnifying Party with reasonable information and assistance to help the Indemnifying Party defend the Claim at the Indemnifying Party's expense. Any Indemnified Party will have the right to employ separate counsel and participate in the defense of any such Claim at its own expense.

9.3 Acknowledgment of Fault and Settling Claims. Neither Party will stipulate, admit or acknowledge any fault or liability on the part of the other without the other's prior written consent. Neither the Indemnifying Party nor the Indemnified Party (if it has tendered the Claim for indemnity) will settle any indemnifiable Claim under this Section 9 or publicize any settlement without the other Party's prior written consent.

10. LIMITATIONS OF LIABILITY

10.1 Exclusion of Certain Damages. SUBJECT TO SECTION 10.3, NEITHER PARTY WILL BE LIABLE FOR ANY INDIRECT, CONSEQUENTIAL, INCIDENTAL, PUNITIVE, OR SPECIAL DAMAGES WHATSOEVER (INCLUDING LOSS OF PROFITS) RELATING TO THIS AGREEMENT OR THE COLLABORATION, EVEN IF SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

10.2 Damages Cap. EXCEPT FOR THE EXCLUSIONS IN SECTION 10.3, THE MAXIMUM, TOTAL, AGGREGATE LIABILITY OF EACH PARTY TO THE OTHER, AND TO ANY THIRD PARTY, FOR ANY AND ALL CLAIMS OR LIABILITIES ARISING UNDER THIS AGREEMENT IS $1,000,000 U.S. DOLLARS OR, IN THE EVENT OF A BREACH OF SECTION 8.2, $5,000,000 U.S. DOLLARS.

10.3 Exclusions. Sections 10.1 and 10.2 do not apply to:

(a) any infringement or misappropriation of a Party's Non-Patent IP or Patent Rights by the other Party;

(b) any breach by either Party of its obligations set forth in Section 7; or

(c) either Party's obligations under Section 9.

10.4 Failure of Essential Purpose. If any remedy under this Agreement is determined to have failed of its essential purpose, all limitations of liability and exclusions of damages will remain in effect to the maximum extent permitted by Applicable Laws.

11. TERM AND TERMINATION

11.1 Term. This Agreement will be effective on the Effective Date and will continue until the seven (7)-year anniversary of the Effective Date, unless otherwise terminated pursuant to the terms of this Agreement or extended by written mutual agreement of the Parties (such period, the "**Development Term**"). If, during the period beginning on the date twelve (12) months before the end of the Development Term and ending on the date six (6) months before the end of the Development Term, either Party notifies the other Party in writing of its desire to extend the Development Period, the Relationship Managers and Project Managers for each Party shall meet within thirty (30) days following delivery of such written notice and discuss in good faith potential extension of the Development Term.

11.2 Mutual Termination. The Parties may mutually agree in writing to terminate this Agreement at any time.

11.3 Termination for Material Breach. In the event that one Party (as the "**Non-Performing Party**") materially breaches or materially fails to perform its obligations under this Agreement, and fails to cure such material breach or fails to perform such obligations within thirty (30) days after receipt of written notice by the other Party, then the other Party may immediately terminate this Agreement upon written notice to the Non-Performing Party. For the avoidance of doubt, failure to achieve technical milestones described in the Development Plan will not be deemed a material breach or a material failure to perform obligations, provided that good faith efforts were exercised by the Party accused of such breach or failure. Microsoft may also terminate this Agreement upon thirty (30) days written notice to Adaptive if Microsoft terminates for cause the letter agreement being entered into by the Parties concurrent with this Agreement that contains Adaptive's minimum guaranteed amounts.

11.4 Wrap Up. In the event of any termination or expiration hereunder, the Parties mutually agree in good faith to (i) promptly cooperate in winding down all Collaboration activities and completing all assignment-related activities contemplated by Section 4.3, and (ii) destroy or return to each other all Confidential Information in one Party's possession or control that is owned solely by the other Party and not licensed to such one Party with rights that survive termination or expiration of this Agreement, and, if requested in writing by the other Party, provide a written certificate confirming compliance with this clause (ii) within sixty (60) days of termination or expiration.

11.5 Survival.

(a) If Adaptive terminates this Agreement under Sections 11.3, (i) the licenses set forth in Sections 5.2 and 5.3 will remain in effect in accordance with their terms, and (ii) Section 6.5 will remain in effect through the end of the original Development Term (disregarding the termination of such Development Term pursuant to Section 11.3), after which it will cease to apply.

(b) If Microsoft terminates this Agreement under Sections 11.3, (i) the exclusive license granted by Microsoft under Section 5.2(a)(i) and (ii) will automatically become non-exclusive (and, for clarity, this license will remain limited to the Field of Use) and the licenses set forth in Sections 5.2(a)(iii), 5.2(b), 5.2(c) and 5.3 will remain in effect in accordance with their terms; (ii) Adaptive will automatically be deemed to grant to Microsoft the license described in Section 5.4(b), and (iii) Sections 6.2, 6.3 and 6.4 will remain in effect through the end of the original Development Term (disregarding the termination of such Development Term pursuant to Section 11.3), after which they will cease to apply.

(c) Upon any other expiration or termination of the Development Term (i.e., where neither Party has terminated this Agreement under Sections 11.3), the licenses set forth in Sections 5.2 and 5.3 will remain in effect in accordance with their terms.

(d) Upon any expiration or termination of the Development Term, the following designated Sections of the Agreement will also survive, and all other Sections of the Agreement will terminate except as specified in Sections 11.5(a), (b) or (c) (as applicable): Sections 4, 7, 8, 9, 10, 11.4, 11.5, and 12, as well as **Exhibit A** to the extent applicable to the foregoing Sections.

12. MISCELLANEOUS

12.1 No Obligation/Independent Development. Except as expressly set forth in Sections 6.2 through 6.5, and with respect to exclusive licenses granted under Section 5 (subject to the terms of Sections 5.4 and 11.5), this Agreement is nonexclusive and does not limit either Party's independent development, marketing, commercialization or other use of any technologies, services or products, provided that any independent development is carried out without use of any Foreground Non-Patent IP or the other Party's Project Materials or Confidential Information. Additionally, subject to Sections 6.2 through 6.5, this Agreement does not restrict either Party from licensing to any Third Party its respective Background Patent Rights and Background Non-Patent IP without any approval or any compensation to the other Party. Nothing in this Agreement will be deemed to require either Party to engage in any efforts or activities to Commercialize products or services conceived or developed under the Collaboration.

12.2 Assignment. This Agreement may not be assigned or otherwise transferred by either Party, nor, except as expressly provided herein, may any right or obligation hereunder be assigned or transferred to a Third Party (excluding, for clarity, any assignment or deemed assignment by Adaptive in connection with a Corporate Event) without the prior written consent of the other Party, which consent will not be unreasonably withheld, delayed, or conditioned. Any assignment without such prior written consent will be null and void and of no legal effect. If such assignment is permitted, the assignee will be responsible for and perform all obligations and duties of the assignor pursuant to and in accordance with the terms and conditions of this Agreement.

12.3 Notices. All notices and requests in connection with this Agreement are deemed given as of the day they are received either by messenger, delivery service, or in the United States of America mails, postage prepaid, certified or registered, return receipt requested, and will be addressed to the receiving Party in accordance with the notice information set forth below the signature block of this Agreement. Each Party may change the persons to whom notices will be sent by giving prior notice to the other.

12.4 Compliance with Laws. Each Party will comply with all Applicable Laws, including privacy and U.S. Export Administration Regulations, as well as end-user, end-use, and destination restrictions issued by the U.S. and other governments.

12.5 Relationship of Parties. The Parties are independent contractors. Neither Party has any express or implied right or authority to assume or create any obligations on behalf of the other Party or to bind the other Party to any contract, agreement or undertaking with any Third Party. Nothing in this Agreement will be construed to create a partnership, joint venture, employment or agency relationship between the Parties.

12.6 Construction. This Agreement has been negotiated by the Parties and their respective counsel and will be interpreted fairly in accordance with its terms and without any strict construction in favor of or against either Party. If any provision of this Agreement is determined by a court of competent jurisdiction to be invalid, illegal, or unenforceable, the Parties will deem the provision to be modified to the extent necessary to allow it to be enforced to the extent permitted by law. If it cannot be so modified, the provision will be deleted from this Agreement, and the remainder of this Agreement will continue to be binding and enforceable according to its terms. Lists of examples following “including”, “e.g.”, “for example”, or the like are interpreted to include “without limitation,” unless qualified by words such as “only” or “solely.” This Agreement will be interpreted according to its plain meaning without presuming that it should favor either Party.

12.7 Third Party Beneficiaries. This Agreement is for the benefit of, and will be enforceable by, the Parties only. It is not intended to confer any right or benefit on any Third Party.

12.8 Governing Law; Jurisdiction and Venue. The laws of the State of Washington govern this Agreement. In the event of any dispute, if federal jurisdiction exists, the Parties consent to exclusive jurisdiction and venue in the federal courts of the Western Washington, and if not, the Parties consent to exclusive jurisdiction and venue in the courts located in King County, Washington. The provisions of the 1980 U.N. Convention on Contracts for the International Sale of Goods do not apply. Both Parties waive all defenses of lack of personal jurisdiction and *forum non conveniens*. Process may be served on either Party in the manner authorized by applicable law or court rule. If either Microsoft or Adaptive employs attorneys to enforce any rights arising out of or relating to this Agreement, the substantially prevailing Party will be entitled to recover its costs, including reasonable attorneys’ fees.

12.9 Taxes. Each Party will be responsible for the payment of its own tax liability arising from entry into or performance under this Agreement or any activities contemplated by it.

12.10 Compliance with Laws. Anything contained in this Agreement to the contrary notwithstanding, the obligations of the Parties hereto will be subject to all laws, present and future, of any government entity having jurisdiction over the Parties hereto, and to orders, regulations, directions or requests of any such government entity.

12.11 Use of Contractors. If a Party uses any Third Party contractors in performance under this Agreement, such Party will take all necessary steps to have such contractors comply with all terms and conditions of this Agreement, including without limitation confidentiality, and will be responsible for the breach of this Agreement by any such contractor. Each Party will require that its Third Party contractors assign to it all right, title and interest in any work product, materials, data and intellectual property rights created by such Third Party contractor in connection with activities under the Collaboration.

12.12 Modification; Waiver. This Agreement may be modified, amended, or altered, or any rights under this Agreement waived, only by a written instrument signed by a duly authorized representative of each Party. The waiver of any breach or default will not constitute a waiver of any other right under, or any subsequent breach or default of, this Agreement.

12.13 Entire Agreement. This Agreement (together with the NDA and each exhibit attached hereto, each of which is incorporated herein by this reference) constitutes the entire understanding and agreement between the Parties with respect to the subject matter hereof and merges and supersedes any and all prior or contemporaneous, electronic, oral, or written agreements, understandings, representations, negotiations, discussions, communications, or proposals, whether implied or express.

12.14 Counterparts; Electronic Signature Process. This Agreement may be executed in two or more counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument. This Agreement may be executed by electronic means.

[Remainder of page left blank intentionally.]

SIGNATURE PAGE

IN WITNESS WHEREOF, the Parties have executed this Agreement by each of their duly authorized representatives and it will be effective as of the Effective Date.

ADAPTIVE BIOTECHNOLOGIES CORPORATION

Signature: /s/ Chad M. Robins
Print Name: Chad M. Robins
Print Title: CEO & Co-Founder
Adaptive Biotechnologies
Signature Date: 12/8/17

MICROSOFT CORPORATION

Signature: /s/ Peter K. Lee
Print Name: Peter K Lee
Print Title: CVP, Microsoft Research

Signature Date: December 11, 2017

Notice and Contact Information

Address: 1551 Eastlake Ave E
Seattle, WA 98102 U.S.A.
Business Contact:
Phone Number:
Fax Number:
E-Mail Address:
All legal notices must also be sent to the address above, attention General Counsel, Gene DeFelice.

Address: One Microsoft Way
Redmond, WA 98052 U.S.A.
Business Contact:
Phone Number:
Fax Number:
E-Mail Address:
All legal notices must also be sent to the address above, attention Deputy General Counsel, Artificial Intelligence & Research Group.

EXHIBIT A

Definitions

Initially capitalized terms used in this Agreement will have the meanings set forth in this **Exhibit A** or as otherwise specified in the Agreement, including its Exhibits.

"**Adaptive's Outputs**" means (a) the Input Data and (b) all Computational Models developed, authored, or otherwise created by the Parties' employees, agents, or contractors individually or jointly as part of the Collaboration.

"**Affiliate**" means any legal entity that Controls, is Controlled by, or is under common Control with a Party or other specified entity. An entity will be deemed an "Affiliate" of the applicable Party or specified entity only so long as such Control exists.

"**Algorithm**" means a computational specification and associated software for data processing and calculations that takes Input Data and generates and executes Computational Models.

"**Applicable Laws**" means all applicable international, federal, state and local laws, ordinances, regulations, orders and other legal requirements, now or hereafter in effect, of governmental authorities having jurisdiction.

"Azure Services" or "**Azure**" means one or more of the Microsoft services and features identified at http://azure.microsoft.com/en-us/, and any updates, new versions and successors to such services or features.

"**Claim**" means any lawsuit, action, proceeding, investigation by any governmental authority, demand, or other claim by any Third Party, together with any related cash liabilities, damages, costs, and expenses (including attorneys' fees).

"**Collaboration**" means all activities undertaken by the Parties, separately or jointly, pursuant to this Agreement.

"**Commercialize"** means to use, copy, reproduce, sell, offer to sell, import, display, distribute, license, translate, publicly display, publicly perform, create derivative works of, broadcast, transmit, rent, lease, lend and otherwise exploit Non-Patent IP within the scope specified in an applicable provision of this Agreement. Any license granting the right to Commercialize Non-Patent IP includes the right for the licensee to grant sublicenses to vendors or contractors solely for purposes of the authorized Commercialization.

"**Computational Model**" means a mathematical representation, generated by applying Algorithms to Input Data, of various mappings or predictions of interest related to TCR-antigen associations.

"Control" means, as to an entity or person, owning a majority of the outstanding equity interests of such entity or person or having the right (whether or not contingent) to control the appointment of a majority of the directors or officers of such entity or person or to otherwise manage or direct the operations of such entity or person.

"**Corporate Event**" shall have the meaning set forth in Adaptive's Amended and Restated Articles of Incorporation, as in effect on the date hereof.

"**Development Plan**" means the document attached as **Exhibit B** that describes the activities to be carried out as the Collaboration, or such updated or modified version of such document as may be mutually approved by the Parties in accordance with Section 2.1.

"**Field of Use**" means diagnostics, therapeutics, or immunological research.

"**Immunomics AI Services**" means software and cloud-hosted services that use the Algorithms and Computational Models to implement and execute applications. For clarity, Immunomics AI Services do not include Algorithms.

"**Input Data**" means TCR, antigen, and binding information, as well as any associated metadata or clinical data such as patient medical records, in each case as owned, developed or licensed by Adaptive or which Adaptive otherwise has the right to use.

"**Microsoft's Outputs**" means the Immunomics AI Services and all Algorithms developed, authored, or otherwise created by the Parties' employees, agents, or contractors individually or jointly as part of the Collaboration.

"NDA" means the Non-Disclosure Agreement entered into between the Parties dated July 21, 2017, as set forth in **Exhibit D.**

"Non-Patent IP" means all intellectual property rights worldwide, existing under statute or at common law or equity, in force or recognized now or in the future, with the exceptions of Patent Rights and Trademarks. Non-Patent IP includes, without limitation (except as set forth in the foregoing sentence): (a) copyrights, trade secrets, and mask works; (b) any application or right to apply for these rights; (c) all renewals, extensions, and restorations of these rights; and (d) any other intellectual property rights in data or research materials.

"**Background Non-Patent IP**" means all Non-Patent IP owned or controlled by a Party or its Affiliates that is (i) developed, authored, obtained or acquired before the Effective Date (together with any improvements, modifications or derivatives of the foregoing developed, authored, obtained or acquired after the Effective Date and arising from the Collaboration), or (ii) developed, authored, obtained or acquired independently from the Collaboration. For clarity, Computational Models will not be deemed to be derivatives of the Algorithms that generate them.

"**Foreground Non-Patent IP**" means all Non-Patent IP developed or authored by the Parties' employees, agents, or contractors individually or jointly as part of the Collaboration, but excluding any Background Non-Patent IP.

"**Offering**," as to either Party, means any technology, service, product or component of any of the foregoing, including internal, preview, pre-release and generally available versions; any specification or other proposal for any such technology, service, product or component; and any documentation for any such technology, service, product or component.

“Patent Rights” means all patent rights worldwide, existing under statute or at common law or equity, in force, or recognized now or in the future, including: (a) patents or applications, inventions, and designs; and (b) any applications, registrations or rights to apply for the foregoing rights, and all renewals, extensions, continuations, divisionals, re-issues, and restorations.

“Background Inventions” means Patent Rights owned or controlled by a Party or its Affiliates that are (i) developed, conceived, reduced to practice, obtained or acquired before the Effective Date (together with any improvements and modifications of the foregoing developed, conceived, reduced to practice, obtained or acquired after the Effective Date and arising from the Collaboration), or (ii) developed, conceived, reduced to practice, obtained or acquired independently from the Collaboration. For clarity, Computational Models will not be deemed to be improvements or modifications of the Algorithms that generate them.

“Adaptive Foreground Inventions” means Patent Rights developed, conceived or reduced to practice solely by Adaptive’s employees, agents, or contractors as part of the Collaboration, but excluding any Background Inventions.

“Joint Foreground Inventions” means Patent Rights developed, conceived or reduced to practice jointly by one or more of Adaptive’s employees, agents, or contractors and one or more of Microsoft’s employees, agents, or contractors as part of the Collaboration, but excluding any Background Inventions.

“Microsoft Foreground Inventions” means Patent Rights developed, conceived or reduced to practice solely by Microsoft’s employees, agents, or contractors as part of the Collaboration, but excluding any Background Inventions.

“**Project Materials**” means all pre-existing (i.e., not created or developed under the Development Plan) technologies, tools, materials and data that are provided by either Microsoft or Adaptive for use in the Collaboration, excluding any Background Non-Patent IP and any Background Inventions.

“**Sell**” means to make, have made, use, sell, offer to sell and import under the applicable Patent Rights within the scope specified in an applicable provision of this Agreement.

“**Third Party**” means a person or entity that is not an Affiliate of a Party.

“Trademark” means any word, phrase, name, trade name, trademark, logo, brand, trade dress, acronym, symbol, emblem or other identifier that identifies and distinguishes the source of goods or services associated therewith.

EXHIBIT B

Development Plan

Collaborative Development Plan for
The Microsoft/Adaptive Biotechnologies TCR-Antigen Map Project

Vision

We aim to translate the scale and precision of the adaptive immune system to diagnose and treat disease. More specifically, we seek to develop a universal disease diagnostic based on a single blood draw and T-cell Receptor (TCR) sequencing.

Problem

[***] Adaptive has technologies for sequencing TCRs at scale, and has initial demonstration that the TCR repertoire is predictive of infection with certain pathogens and cancers, as well as predictive of responses to certain antigens. However, the existing predictive models are limited in scope (order 10 antigens, and single infections) and their accuracy is not high enough for clinical use.

Solution

[***]

Operational Governance

Executive Sponsors. Peter Lee (MSFT), Chad Robins (Adaptive)

Project Managers. Desney Tan and Jonathan Carlson (MSFT), Sean Nolan and Harlan Robins (Adaptive)

Specific named individuals may change over time as appropriate to support success of the project.

Roles and Responsibilities. Adaptive will provide Immunology expertise and drive data acquisition; Microsoft will provide Machine Learning (ML) expertise and drive algorithmic and software development. Data acquisition may include acquisition of samples, TCR sequencing, and related bioinformatic and infrastructure software. Adaptive will grant Microsoft access to existing TCR, binding and clinical data, and the two teams will work together to develop a data acquisition strategy. Microsoft will provide ML algorithm development and cloud-based services that ingest TCR sequences and output diagnostic and/or antigen binding predictions. We expect that data acquisition will adapt to the needs of the ML models over time. As appropriate during the course of the project, Adaptive and Microsoft will collaboratively determine milestones, target diseases and use cases, and go-to-market strategies.

The Adaptive technical team will initially be made up of [***] including lab, computational biology and software resources. This project will represent a significant portion of Adaptive’s portfolio; additional laboratory and other resources are envisioned to be committed.

The Microsoft technical team will comprise a combination of dedicated researchers and engineers spending the majority of their energy on the TCR-Antigen Mapping Project, as well as a larger set of internal collaborators adding specific expertise at appropriate points in the project. The team is expected to [***]. Additionally, Microsoft intends to mobilize non-technical Microsoft resources, including marketing and communications, business development, privacy and compliance, as well as field and sales teams.

The above is for planning purposes only and subject to ongoing assessment and adjustment as the project proceeds.

Communications and Cadence. Communication will be broadly encouraged at all levels of the project and teams. To facilitate, we anticipate frequent in-person meetings among the principals, and regular meetings that include the entire team. Teams will (separately or collaboratively) provide status reports at similar cadence.

At least bi-annually, the Executive Sponsors will, together with appropriate team members, meet to review progress and discuss outstanding issues or proposed changes in direction or priority. These checkpoints will provide a mechanism to ensure attention to long-term success, but are not intended to delay important decision-making or limit communication between team members in any way.

Project Roadmap and Schedule

[***]

Note that this project requires a significant amount of R&D, and strong emphasis will be placed on pivoting quickly and not being tied to a preconceived path. This roadmap is thus an example of how we expect this project may proceed.

Year 1

[***]

Year 2-3

[***]

Year 4-6

[***]

Year 10

[***]

Exhibit C

Escalation Procedures

The Parties will work together to resolve disputes that may arise under this Agreement in a collaborative fashion. If a dispute arises that the Parties are unable to resolve in their normal course of operations, then, except with respect to issues described in Section 7 of this **Exhibit C**, each Party agrees to use the escalation process described in Section 2 through Section 4 of this **Exhibit C** ("**Formal Escalation**") to resolve the dispute (an "**Escalated Dispute**") and each Party agrees to suspend pursuit of any other remedies to which it may be entitled with respect to the Escalated Dispute until completion of Formal Escalation.

1. **Relationship Managers**. As of the Effective Date, each Party has designated the following individual to serve as its Relationship Manager:

   Adaptive Relationship Manager: _____

   Microsoft Relationship Manager: _____

2. **Notice of Formal Escalation**. One Party 's Relationship Manager will provide written notice to the other Party's Relationship Manager that they wish to invoke Formal Escalation ("**Notice of Escalation**").

3. **First Negotiation Period**. During the fifteen (15) calendar days immediately following receipt of the Notice of Escalation, or such other time period on which the Parties agree in writing (such period, the "**First Negotiation Period**"), each Party will have its Relationship Manager engage in good faith negotiations (in person or by phone) with the other Party's Relationship Manager to resolve the Escalated Dispute.

4. **Escalation to Supporting Sponsors**. If the Escalated Dispute is not resolved by the end of the First Negotiation Period, then each Party will have a senior executive promptly engage in good faith negotiations with the other Party's senior executive (in person, unless otherwise agreed in writing by the Parties) during the fifteen (15) calendar days immediately following the end of the First Negotiation Period, or such other time period on which the Parties agree in writing, to resolve the Escalated Dispute (such period, the "**Second Negotiation Period**").

5. **Resolved Disputes**. If the Escalated Dispute is resolved at any stage during Formal Escalation then, as appropriate, the Relationship Managers will oversee implementation of the decision of the Parties resolving the dispute, provided, however, that any amendment, modification or alteration of or any waiver under this Agreement shall comply with the provisions set forth in Section 12.12 of this Agreement.

6. **Unresolved Disputes**. If the Escalated Dispute is not resolved by the end of the Second Negotiation Period, then each Party will be entitled to pursue any remedy to which such Party is entitled under this Agreement, at law or in equity.

7. **Exclusions from Formal Escalation.** Formal Escalation will not apply to or limit the right of a Party: (i) to seek a temporary restraining order or other provisional remedy to preserve the status quo or to prevent irreparable harm; or (ii) to exercise its termination rights under Section 11 of this Agreement.

Exhibit D

Non-Disclosure Agreement

Microsoft

Non-Disclosure Agreement

This Non-Disclosure Agreement ("agreement") is between the patties signing below. "We," "us" and "our" refer to both of the patties signing below and our respective affiliates.

COMPANY AND ITS AFFILIATES or INDIVIDUAL: Adaptive Biotechnologies Address: 1551 Eastlake Ave E Seattle, WA 98102 USA	**MICROSOFT CORPORATION AND ITS AFFILIATES** One Microsoft Way Redmond, WA 98052-6399 USA
Sign: /s/ Gene DeFelice	/s/ Lucy Bassli
Print Name: GENE DEFELICE Print Title: Senior Vice President, General Counsel Signature Date:7/21/17	Lucy Bassli (CELA) 21-Jul-17

For information about this agreement, contact the Microsoft Contact, Vikram Dendi.

1. The purpose of this agreement. This agreement allows us to disclose confidential information to each other, to our own affiliates and to the other's affiliates, under the following terms. An "affiliate" is any legal entity that one of us owns, that owns one of us or that is under common control with one of us. "Control" and "own" mean possessing a 50% or greater interest in an entity or the right to direct the management of the entity.

2. Confidential information.

a. **What is included.** "Confidential information" is non-public information, know-how and trade secrets in any form that:

- Are designated as "confidential"; or
- A reasonable person knows or reasonably should understand to be confidential.

b. **What is not included.** The following types of information, however marked, are not confidential information. Information that:

- Is, or becomes, publicly available without a breach of this agreement;
- Was lawfully known to the receiver of the information without an obligation to keep it confidential;
- Is received from another source who can disclose it lawfully and without an obligation to keep it confidential;
- Is independently developed; or
- Is a comment or suggestion one of us volunteers about the other's business, products or services.

3. Treatment of confidential information.

a. **In general**. Subject to the other terms of this agreement, each of us agrees:

- We will not disclose the other's confidential information to third parties; and
- We will use and disclose the other's confidential information only for purposes of our business relationship with each other.

b. **Security precautions.** Each of us agrees:

- To take reasonable steps to protect the other's confidential information. These steps must be at least as protective as those we take to protect our own confidential information;
- To notify the other promptly upon discovery of any unauthorized use or disclosure of confidential information; and
- To cooperate with the other to help regain control of the confidential information and prevent further unauthorized use or disclosure of it.

c. **Sharing confidential information with affiliates and representatives.**

- A "representative" is an employee, contractor. advisor or consultant of one of us or one of our respective affiliates.
- Each of us may disclose the other's confidential information to our representatives (who may then disclose that confidential information to other of our representatives) orly if those representatives have a need to know about it for purposes of our business relationship with each other. Before doing so, each of us must:
  - ensure that affiliates and representatives are required to protect the confidential information on terms consistent with this agreement; and
  - accept responsibility for each representative's use of confidential information.
- Neither of us is required to restrict work assignments of representatives who have had access to confidential information. Neither of us can control the incoming information the other will disclose to us in the course of working together, or what our representatives will remember, even without notes or other aids. We agree that use of information in representatives' unaided memories in the development or deployment of our respective products or services does not create liability under this agreement or trade secret law, and we agree to limit what we disclose to the other accordingly.

d. **Disclosing confidential information if required to by law**. Each of us may disclose the other's confidential information if required to comply with a court order or other government demand that has the force of law. Before doing so, each of us must seek the highest level of protection available and, when possible, give the other enough prior notice to provide a reasonable chance to seek a protective order.

4. **Length of confidential information obligations.**

a. **Termination.** This agreement continues in effect until one of us terminates it. Either of us may terminate this agreement for any reason by providing the other with 30 days' advance written notice. Termination of this agreement will not change any of the rights and duties made while this agreement is in effect.

b. **No other use or disclosure of confidential information**. Except as permitted above, neither of us will use or disclose the other's confidential information for five years after we receive it. The five-year time period does not apply if applicable law requires a longer period.

5. General rights and obligations.

a. **Law that applies; jurisdiction and venue.** The laws of the State of Washington govern this agreement. If federal jurisdiction exists, we each consent to exclusive jurisdiction and venue in the federal courts in King County, Washington. If not, we each consent to exclusive jurisdiction and venue in the Superior Court of King County, Washington.

b. **Compliance with law.** Each of us will comply with all export laws that apply to confidential information.

c. **Waiver.** Any delay or failure of either of us to exercise a right or remedy will not result in a waiver of that, or any other, right or remedy.

d. **Money damages insufficient**. Each of us acknowledges that money damages may not be sufficient compensation for a breach of this agreement. Each of us agrees that the other may seek court orders to stop confidential information from becoming public in breach of this agreement.

e. **Attorneys' fees.** In any dispute relating to this agreement the prevailing party will be entitled to recover reasonable attorneys' fees and costs.

f. **Transfers of this agreement.** If one of us transfers this agreement, we will not disclose the other's confidential information to the transferee without the other's consent.

g. **Enforceability.** If any provision of this agreement is unenforceable, the parties (or, if we cannot agree, a court) will revise it so that it can be enforced. Even if no revision is possible, the rest of this agreement will remain in place.

h. **Entire agreement.** This agreement does not grant any implied intellectual property licenses to confidential information, except as stated above. We may have contracts with each other covering other specific aspects of our relationship ("other contracts"). The other contract may include commitments about confidential information, either within it or by referencing another non-disclosure agreement. If so, those obligations remain in place for purposes of that other contract. With this exception, this is the entire agreement between us regarding confidential information. It replaces all other agreements and understandings regarding confidential information. We can only change this agreement with a signed document that states that it is changing this agreement.

Certain information has been excluded from this exhibit because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

MASTER COLLABORATION AGREEMENT

This Master Collaboration Agreement (this "**Agreement**") is made effective as of July 10, 2015 by and between ADAPTIVE BIOTECHNOLOGIES CORPORATION, a Washington corporation ("**Adaptive**"), and Adaptimmune Limited, a limited company formed under the laws of England and Wales ("**Collaborator**" and together with Adaptive, the "**Parties**").

BACKGROUND

Collaborator desires to access Adaptive's advanced immune profiling technology to facilitate its business of developing and commercializing pharmaceutical products. The Parties have therefore entered into this Agreement to set forth the terms and conditions of their research collaboration.

AGREEMENT

1. SCOPE OF COLLABORATION

(a) Projects. Adaptive hereby agrees to collaborate with Collaborator on such projects as may be mutually agreed to by the Parties in writing from time to time (each, a "**Project**"). This Agreement sets forth the general terms and conditions applicable to the work to be performed with respect to any and all Projects.

(b) Project Orders. With respect to each Project, Adaptive and Collaborator will prepare and execute a written project order (each a "**Project Order**") setting forth the specific tasks to be performed by each Party, the timeline for performing the tasks, the estimated fees and expenses associated with the tasks, the payment schedule applicable to the tasks, format of deliverables associated with the tasks, and any other matters deemed appropriate by Adaptive and Collaborator. Either Party may accept or reject a proposed Project Order for any reason in its sole discretion, and no Project Order will be effective until executed by both Parties. As appropriate, Project Orders will logically and/or sequentially order and/or group tasks and note decision points. Each mutually executed Project Order will be attached to this Agreement.

(c) Conflicts. In the case of a conflict between the terms of this Agreement and a Project Order, the terms and conditions of this Agreement will control unless Adaptive and Collaborator specifically acknowledge in the Project Order their intent to modify the terms and conditions of this Agreement.

2. OBLIGATIONS OF COLLABORATOR

(a) Provision of Collaborator Materials. Collaborator will supply all biological samples and any related information reasonably required to carry out the Projects conducted under this Agreement and which Collaborator has in its possession and control, including those described in the applicable Project Order (collectively, the "**Material**s") in such formats as Adaptive may reasonably request or as otherwise set forth in more detail in a Project Order. All Materials will be deemed Confidential Information of Collaborator within the meaning of Section 4.

(b) Handling of Materials; De-identification. Collaborator represents and warrants that (i) as at the time any Material is supplied to Adaptive by Collaborator, Collaborator has the right to send the Materials to Adaptive for all uses contemplated by this Agreement in relation to such Materials, (ii) the

Materials contain no information that could be used to identify the individuals from which such Materials were derived, and (iii) proper informed consent has been obtained for the transfer of the biological samples and other Materials to Adaptive for the purposes of performing research, including documented approvals of patients or institutional review board that may be required by applicable law or regulation. Collaborator will notify Adaptive if it becomes aware at any time that it ceases to have the right to supply any Material to Adaptive for the uses contemplated by this Agreement. Adaptive may upload, use, display and modify the Materials and Collaborator Developments into the immunoSEQ™ Analyzer database for storage and use solely for the purposes contemplated under the relevant Project Order.

(c) For Research Use Only; Not for Diagnostic Use. In no event will Collaborator use the Collaborator Developments or other data and results provided by Adaptive hereunder for diagnosing, evaluating or treating individual patients from which the samples were derived.

3. OBLIGATIONS OF ADAPTIVE

(a) Adaptive Obligations Generally. Adaptive will provide the facilities, personnel and other resources required for the Projects other than biological materials and related information to be supplied by Collaborator. Adaptive will not sub-contract performance of the Projects to any third party without Collaborator's prior written consent, other than Adaptive's wholly owned subsidiary, Sequenta LLC and provided Sequenta LLC is identified in any Project Order as carrying any part of the relevant Project. Adaptive will conduct each Project with reasonable skill and care, in a good scientific manner, in accordance with the applicable Project Order and in accordance with relevant industry standards and any laws and regulations generally applicable to research laboratories in Adaptive's line of business and jurisdiction and to the services being provided by Adaptive. With respect to each Project, Adaptive will communicate regularly with Collaborator and respond to reasonable requests for status updates. Project Orders will be performed in accordance with the policies set out in Exhibit A to this Agreement. Adaptive will ensure that in performing the Project it uses personnel which are suitably qualified and experienced to perform the activities delegated to them.

(b) Delivery of Results. Subject to timely receipt of the Materials and payment of amounts due hereunder, Adaptive will use its commercially reasonable efforts to complete each Project within the timeline established for such Project. Adaptive will keep Collaborator reasonably informed of the progress of the Project as against timelines. Adaptive will provide the results of each Project to Collaborator in its customary *.TSV format through the immunoSEQ Analyzer software platform (including the entire raw processed data set). Subject to Collaborator's timely payments of all amounts accrued hereunder, Adaptive will use its commercially reasonable efforts to retain all Project results for at least 24 months following the completion of each Project. Adaptive will notify Collaborator where reasonably possible prior to any destruction of any Project results prior the expiration of such period and provide Collaborator with an opportunity to store Project results itself or at a nominated third party.

(c) Handling of Biological Materials. Adaptive will test, handle and store all materials supplied by Collaborator in accordance with Adaptive's customary handling procedures and any special handling instructions set forth in a Project Order, and will return or destroy all unused biological materials supplied by Collaborator. Samples received by Adaptive will be handled in accordance with Adaptive SOPs. All arriving packages will be opened the same day they arrive and Inspected thoroughly for correct labeling and packaging integrity. Adaptive will contact Collaborator via phone or email promptly about any sample receipt issues, including identification, modification in shipping conditions, or condition of the sample which may delay sample processing. Should any sample be deemed unacceptable for processing. Adaptive

will communicate with Collaborator about the nature of the issue. More specific handling requirements may be set forth in the Project Order. Materials provided by the Collaborator (and any derivatives, modifications or progeny of such materials) shall only be used for the performance of the relevant Project Order and must not be provided to any third party. Materials provided by Collaborator (and any derivatives, modifications or progeny of such materials) and information associated with such materials will constitute Confidential Information of Collaborator.

(d) No Debarred Personnel. Adaptive represents that, to its knowledge, no person who will perform activities under this Agreement has been suspended, debarred or subject to temporary denial of approval, nor is under consideration to be suspended, debarred or subject to temporary denial of approval, by the U.S. Food and Drug Administration from working in or providing services, directly or indirectly, to any applicant for approval of a drug product or any pharmaceutical or biotechnology company under the Generic Drug Enforcement Act of 1992, as amended.

(e) Limited Warranty. Collaborator understands that the Projects are experimental and Adaptive cannot guarantee any outcome. Collaborator's sole warranty with respect to the services performed under this Agreement is that Adaptive will perform such services in accordance with generally prevailing industry standards and all laws, rules and regulations applicable to Adaptive.

4. CONFIDENTIALITY

(a) Definitions. For purposes of this Agreement, the term "**Confidential Information**" means any scientific, technical, trade or business information possessed by a Party which is treated by such Party as confidential or proprietary, including information pertaining to cells, antibodies, organisms, chemical compounds, products, formulations, technologies, techniques, methodologies, algorithms, computer programs, computer security systems and processes, assay systems, procedures, tests, data, documentation, reports, sources of supply, know-how, patent positioning, relationships with employees and consultants, business plans, business developments, research, development, process development, manufacturing, commercialization, and marketing, and any other confidential information about or belonging to a Party's affiliates, suppliers, licensors, licensees, partners, collaborators, customers or others, and is provided by one Party or its affiliated companies (the "**Discloser**") to the other Party (the "**Recipient**") under this Agreement. Without limiting the generality of the foregoing, the Collaborator Materials and the Collaborator Developments (as defined in Section 5) constitute Confidential Information of Collaborator, and the pricing offered to Collaborator and the other general terms of this Agreement constitute Confidential Information of Adaptive. For the purpose of clarity, the identity of any of Collaborator's programs or drug development candidates will be considered Collaborator's Confidential Information.

(b) Confidentiality Obligation. Each Party agrees that, except in connection with the performance of its obligations under this Agreement or the exercise of its rights or licenses under this Agreement, it will not otherwise use in any way for its own account or the account of any third party, nor disclose to any third party, any Confidential Information revealed to it by the other Party; provided, however, that Confidential Information may be disclosed pursuant to a regulation, law, court order or rule of any applicable securities exchange, but only to the minimum extent required to comply with such regulation, order, or rule and with advance written notice to the Discloser; and provided further that a Recipient may disclose Confidential Information to its subsidiaries, affiliates, professional advisors, consultants, agents to the extent such entities or individuals require access to the Confidential Information for the performance of obligations under this Agreement or the exercise of rights or licenses

under this Agreement provided that they are under confidentiality and use limitations consistent with those in this agreement and such Party will be liable for breaches of the restrictions set forth in this Section 4 by all such persons. Each Party will take commercially reasonable efforts to protect the confidentiality of the other Party's Confidential Information, such precaution not to be less than the precautions each Party takes to protect the confidentiality of its own Confidential Information of the same kind. Collaborator may also disclose Confidential Information of Adaptive to its third-party collaborators where such disclosure is necessary for the performance of the relevant collaboration that relates to the therapeutic agent that is the subject of the Project or the data and results provided by Adaptive hereunder, provided that they are under confidentiality and use limitations consistent with those in this agreement and Collaborator will be liable for breaches of the restrictions set forth in this Section 4 by all such persons. Each party will ensure that any Confidential Information of the other Party (including, with respect to Collaborator, the Collaborator Developments) will be stored securely and can be easily retrieved.

(c) Exclusions. For purposes of this Agreement, the term Confidential Information does not include any information which (i) was known to Recipient at the time it was disclosed, other than by previous disclosure by Discloser; (ii) becomes known by disclosure from a third party without an obligation of confidentiality; (iii) is or becomes publicly known without breach of this Agreement; or (iv) is independently developed by the Recipient without the use of the Discloser's Confidential Information. The obligations of confidentiality under this Section 4 will survive and continue after any expiration or termination of the Project Order under which such Confidential Information was disclosed or this Agreement.

5. DEVELOPMENTS

(a) Ownership of Pre-existing Materials. All information and materials furnished by a Party pursuant to this Agreement and all associated intellectual property rights will remain the exclusive property of the furnishing Party, including without limitation Collaborator's ownership of the Materials. All preexisting or separately developed technology and associated intellectual property rights used by Adaptive in conducting the Projects, including Adaptive's predictive algorithms, assays and associated methods (collectively the "**Adaptive Technology**"), will remain the exclusive property of Adaptive. No rights are granted by either Party to their pre-existing intellectual property except the limited licenses expressly set forth herein. Collaborator will not attempt to reverse engineer, characterize, or ascertain the chemical structure of Adaptive's assays or proprietary algorithms or other elements of the Adaptive Technology.

(b) Ownership of Project Deliverables. Other than the Adaptive Developments, all results arising from the performance of a Project (including all associated intellectual property rights in and to such results) will be solely owned by Collaborator (the "**Collaborator Developments**"). Adaptive hereby assigns and agrees to assign to Collaborator all of its right, title and interest in and to the Collaborator Developments. Adaptive will solely own the Adaptive Developments and all associated intellectual property rights. The term "**Adaptive Developments**" means inventions and discoveries arising from a Project that consist of modifications, refinements or improvements to the Adaptive Technology and all diagnostic applications, provided that in each case the practice of such inventions and discoveries does not require the use of any pre-existing Confidential Information or intellectual property rights of Collaborator.

(c) The test results, receptor sequences and other data and analysis will be delivered in the formats specified in the Project Order (or if blank, in a mutually agreed format readily readable by commercially available off-the-shelf software such as Microsoft Office). Adaptive confirms and represents that the test results, receptor sequences and other data and analysis delivered to Collaborator can be used within any need to access the Adaptive Technology or Adaptive Developments.

(d) Each party agrees that it shall have sufficient agreements in place with its employees or other individuals performing the Project to ensure that any intellectual property rights are owned in accordance with this Section 5 and in particular that all Collaborator Developments are owned by Collaborator. Adaptive will provide all reasonable assistance as may be required to ensure that title to Collaborator Developments vests in Collaborator including as relevant the obtaining of confirmatory assignment agreements from individuals if required in relation to any registration or prosecution of any intellectual property rights.

6. PAYMENTS

(a) Sequencing Price; Discounts. ImmunoSEQ™ sequencing pricing is based on the resolution required for the samples in the Project and will be specified in the relevant Project Order. As of the date of this Agreement, the list price per sample for each locus are as follows: $[***] per Survey sample, $[***] per Deep sample, and $[***] per Ultra Deep sample. [***]

(b) Technology Access Fee. A technology access fee equal to [***] may be invoiced upon completion of sequencing for each Project for basic bioinformatics and experimental design support, use of immunoSEQ Analyzer 2.0 for [***] months following sequencing of hereunder, and up to [***] hours of data analysis support. Where applicable such Technology Access Fee will be specified in the Project Order.

(c) Professional Services. The technology access fee described above includes basic bioinformatics and experimental design support. For Projects that require significantly deeper engagement by Adaptive personnel, Adaptive will separately invoice monthly for such professional services at rates and for times mutually agreed by the parties.

(d) Project Payment Schedule. The payment schedule for each Project shall be specified in the relevant Project Order, provided, however, that if no payment schedule is specified Projects with total charges under $[***] will be invoiced [***]% in advance, and for larger Projects Collaborator will pay to Adaptive the assay charges for each Project according to the payment schedule below:

First payment [***]	[***]%
Second payment [***]	[***]%
Third payment [***]	[***]%
Completion of the Project	[***]%

In this context Completion of the Project constitutes delivery of all deliverables including the final report in agreed format.

All other Project-related charges (including the technology access fee, any applicable taxes, shipping and handling and professional services fees) and in each case as specified in Project Order or otherwise agreed in writing by Collaborator will be invoiced as accrued. All payments are non-refundable.

(e) Invoicing; Payments. Adaptive will invoice Collaborator for each Project in accordance with the payment schedule set forth in the applicable Project Order. Invoiced payments are due within 30 days of receipt. Invoices should be sent to Collaborator at its address stated on the signature page hereto, Attn: Accounts Payable. For any amounts due under this Agreement that are not paid within [***] days of receipt of invoice, Adaptive may accrue interest at [***]% per month, not to exceed the maximum permitted by applicable law. Adaptive will provide written notification of non-payment to Collaborator prior to charging any interest or taking any action to recover any overdue amounts. All sums payable under this Agreement will be exclusive of value added tax or any equivalent sales tax applicable which shall be payable in addition by Collaborator.

7. TERM AND TERMINATION

(a) Term of Agreement. This Agreement will commence on the date first set forth above and will expire 48 months thereafter, *provided, however,* that if one or more Projects remain outstanding and active at the end of such period, the expiration date shall be automatically extended until the scheduled completion date of the last such Project. This Agreement may thereafter be renewed with the express mutual written consent of the Parties.

(b) Termination. Either Party may terminate or suspend its performance under this Agreement or a particular Project in the event of a breach of a material term of this Agreement by the other Party, which breach is not cured within [***] business days ([***] business days in the event of a payment default) after written notice by the non-breaching Party to the breaching Party.

(c) Effect of Termination. Termination of this Agreement will simultaneously terminate all Project Orders then outstanding as of the effective date of termination. In the event of termination, Collaborator will pay all fees and expenses accrued through the effective date of termination. Other than with respect to uncured material breaches by Adaptive, no refunds will be due upon termination. The provisions of Sections 3(e), 2(b), 4, 5, 6(e), 7(c), 8 and the last two sentences of Section 3(b) will survive termination or expiration of this Agreement for any reason.

8. MISCELLANEOUS

(a) Construction. When a reference is made in this Agreement to a Section, such reference is to a section of this Agreement unless otherwise indicated. The words “herein,” “hereunder” and “hereof” refer to this Agreement (taken as a whole and together with any relevant Project Orders) and not to any particular provision of this Agreement. The words “include,” “includes” and “including” will be deemed to be followed by the words “without limitation.” The headings contained in this Agreement are for reference purposes only and will not affect in any way the meaning or interpretation of this Agreement. The words “agrees to”, “will” and “shall” are used in a mandatory, not a permissive, sense. . All payments hereunder will be made in U.S. dollars. The Parties specifically disclaim the application of the UN Convention on Contracts for the International Sale of Goods. This Agreement has been written in the English language, and the Parties agree that the English version will govern.

(b) Independent Contractors. Adaptive and Collaborator are independent contractors and nothing in this Agreement will be construed to create a partnership, joint venture, license or employment relationship between the Parties.

(c) No Implied Warranties; Limited Remedy. Except as expressly stated elsewhere in this Agreement, NEITHER PARTY MAKES ANY GUARANTEE OR WARRANTY, EXPRESS OR IMPLIED, INCLUDING

WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT OR FITNESS FOR A PARTICULAR PURPOSE. THE SOLE REMEDY OF COLLABORATOR FOR BREACH OF WARRANTY HEREUNDER WILL BE TO REQUIRE ADAPTIVE, AT ADAPTIVE'S ELECTION, TO EITHER RE-PERFORM THE PORTION OF THE PROJECT GIVING RISETO SUCH BREACH AT ADAPTIVE'S COST OR REFUND THE FEES PAID BY COLLABORATOR FOR THE PORTION OF THE PROJECT THAT GAVE RISETO SUCH BREACH.

(d) LIMITATION OF LIABILITY GENERALLY. NEITHER PARTY WILL BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES {INCLUDING CLAIMS ARISING FROM LOST DATA AND INDIRECT AND DIRECT LOST PROFITS) (COLLECTIVELY, "**LOSSES**"), ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT, HOWEVER CAUSED, AND UNDER WHATEVER CAUSE OF ACTION OR THEORY OF LIABILITY BROUGHT (INCLUDING, WITHOUT LIMITATION, UNDER ANY CONTRACT, NEGLIGENCE OR OTHER TORT THEORY OF LIABILITY) EVEN IF SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR SUCH DAMAGES WERE OTHERWISE FORESEEABLE. TOTAL CUMULATIVE LIABILITY OF A PARTY IN CONNECTION WITH THIS AGREEMENT AND THE PROJECTS, WHETHER IN CONTRACT OR TORT OR OTHERWISE, WILL NOT EXCEED AN AMOUNT EQUIVALENT TO THE AMOUNT OF FEES PAID TO ADAPTIVE BY COLLABORATOR UNDER THIS AGREEMENT OVER THE 12-MONTH PERIOD PRECEDING THE EVENT GIVING RISE TO SUCH CLAIM. THE LIMITATION OF LIABILITY UNDER THIS PARAGRAPH INCLUDING THE EXCLUSION OF LOSSES DOES NOT APPLY TO THE PAYMENT OF FEES AND EXPENSES OWING UNDER THIS AGREEMENT, LOSSES ARISING FROM THE GROSS NEGLIGENCE OR WILLFUL MISCONDUCT OF A PARTY, OR CLAIMS ARISING UNDER SECTION 2, SECTION 4 AND SECTION 5, OR LOSSES ARISING FROM ANY FRAUD OR FRAUDULENT MISREPRESENTATION.

(e) Notices. All notices under this Agreement must be in writing and at the applicable address set forth on the signature page to this Agreement or at such other address as a Party may specify in writing. Notices are effective as follows: (i) 3 business days following delivery in the mail using recorded delivery, (ii) upon delivery if sent via a nationally recognized commercial courier, (iii) upon delivery if hand-delivered, or (iv) sent by email or facsimile, upon non-automated confirmation of receipt.

(f) Publicity. Any publicity using the other Party's name and logo including on a website, in marketing materials or in any press release must be prior approved by the other Party.

(g) Publications. Without limiting the generality of Section 4 ("**Confidentiality**"), each Party agrees to use reasonable efforts to provide the other Party with advance copies of any publications containing experimental results that directly or Indirectly result from a Project. Such prior provision shall not apply where there are any third party confidentiality restrictions or such release would breach any applicable laws or regulations affecting the publishing party. In any such publication, the publishing Party will acknowledge the other Party's contribution (including authorship if appropriate under the circumstances and customary industry practice).

(h) No Assignment. The rights and obligations under this Agreement may not be assigned or transferred by either Party without the prior written consent of the other Party, except that either Party may assign this Agreement without such consent to an affiliated company or in connection with the merger, consolidation, sale or transfer of all or substantially all of a Party's business to which this Agreement relates.

(i) Entire Agreement. This Agreement, taken together with each mutually executed Project Order, constitutes the entire agreement of the Parties with regard to its subject matter and supersedes all previous oral or written representations, agreements and understandings between Adaptive and Collaborator. Use of the immunoSEQ Analyzer is subject to separate license terms users must accept as part of the account creation or log-in process. Nothing in this clause shall exclude any liability for fraud or fraudulent misrepresentation.

(j) Amendments; No Implied Waivers. This Agreement may only be modified in writing, executed by duly constituted officers of both Parties. Any terms and conditions on a purchase order or a bill of lading that conflict with or are in addition to any of the terms of this Agreement will be null and void and without legal effect unless expressly agreed upon by the Parties in a written document specifically referencing this Section 8(j). Either Party's waiver of any term or condition of this Agreement at any time will not be construed to waive such term or condition at subsequent times or any other term or condition, nor as a waiver of its rights to enforce such term or condition.

(k) Severability. In the event that any one or more provisions of this Agreement are, for any reason, held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability will not affect any other provision of this Agreement, and all other provisions will remain in full force and effect. If any of the provisions are held to be excessively broad, any such provision will be reformed and construed by limiting and reducing it so as to be enforceable to the maximum extent permitted by law.

(l) Governing Law. This Agreement will in all events and for all purposes be governed by and construed in accordance with the law of New York, without regard to any choice of law principle that would dictate the application of the law of another jurisdiction. The Parties consent to the exclusive jurisdiction of the state and federal courts located in New York County, New York for all claims or disputes arising in connection with this Agreement. In any suit or action brought to enforce this Agreement, or to obtain an adjudication, declaratory or otherwise, of rights hereunder, the losing Party will pay to the prevailing Party reasonable attorneys' fees and all other costs and expenses that may be incurred by the prevailing Party in such suit or action.

(m) Counterparts. This Agreement may be executed in counterparts and delivered via facsimile, emailed PDF or other electronic means, each of which will be deemed to be an original, and both of which taken together, will constitute one agreement binding on both Parties.

[Signature Page Follows]

IN WITNESS WHEREOF, the Parties have caused this Agreement to be signed and executed by their duly authorized officers as of the date first written above.

ADAPTIVE

By: /s/ Chad M. Robins

Print Name: Chad M. Robins

Title: CEO, President & Founder

Address: 1551 Eastlake Ave. E., Ste. 200

Seattle, Washington 98102

Facsimile: (206) 659-0667

Email: support@adaptiveblotechnoloeles.com

COLLABORATOR

By: /s/ H.K. Tayton-Martin

Print Name: H.K. Tayton-Martin

Title: Chief Operating Officer

Address: 91 Park Drive Milton Park

Abingdon, England, UK

Facsimile: N/A

Email: N/A

TEMPLATE FOR PROJECT ORDER NO. 1

PURSUANT TO MASTER COLLABORATION AGREEMENT

This Project Order No. 1 (this "**Project Order**") is made effective as of _____, 201__ by and between ADAPTIVE BIOTECHNOLOGIES CORPORATION, a Washington corporation ("**Adaptive**"), and Adaptimmune Limited,, a limited formed under the laws of England and Wales ("**Collaborator**") pursuant to the Master Collaboration Agreement between the Parties dated July 10, 2015 (the "**Agreement**"). The activities described in this Project Order will be governed by the terms and conditions of the Agreement. Capitalized terms used herein and not otherwise defined will have the meanings given such terms in the Agreement.

1. PROJECT DESCRIPTION

(a) Project Overview and Objectives.

Exploratory analyses of [INSERT T OR B] cell diversity by [INSERT SEQUENCING DEPTH] sequencing of [INSERT LOCUS TO BE SEQUENCED] will be performed on [INSERT MATERIAL TYPE] samples. [INSERT MATERIAL TYPE] obtained from Protocol INSERT PROTOCOL NUMBER will be assessed. The sequencing data generated by Adaptive will be used by Collaborator to monitor [INSERT WHAT WE WILL MONITOR].

Objectives of the correlative study may include:

- Determine if a minimum threshold of baseline T cell or B cell diversity correlates with clinical activity
- Characterize the apparent presence/absence and relative quantity of T cell clones during treatment
- Monitor individual sequence frequencies for each patient over the course of therapy and correlate data to outcomes

(b) Samples.

Collaborator will provide to Adaptive [INSERT MATERIAL AND NUMBER OF SAMPLES] samples for use in performing the activities described in this Project Order, together with any related information on a sample manifest as may be reasonably requested by Adaptive to carry out the Project.

Total of ____ patients: ____ Patients each with _____ time points as follows:

(c) Workflow.

(i) [INSERT MATERIAL TYPE] samples will be shipped to Adaptive in provided shipping materials.

(ii) Samples received by Adaptive will be handled in accordance with Adaptive SOPs. All arriving packages will be opened the same day they arrive and inspected thoroughly for correct labeling and packaging integrity. Adaptive will contact Collaborator via phone or email promptly about any sample receipt issues, such as but not limited to identification, modification in shipping conditions, or condition of the sample which may delay sample processing. Should any sample be deemed unacceptable for processing, Adaptive will communicate with Collaborator about the nature of the issue.

(iii) Adaptive will perform "[INSERT SEQUENCING RESOLUTION)" sequencing on each of the [INSERT SAMPLE SOURCE] samples provided by Collaborator. As part of these analyses, Adaptive uses a proprietary assay for the amplification and massively parallel sequencing of millions of CDR3 regions in the (INSERT LOCUS TO BE SEQUENCED] using a multiplex PCR amplification across the VDJ junction of rearranged [INSERT LOCUS TO BE SEQUENCED].

(d) Adaptive Deliverables. Within 6-8 weeks of Adaptive's receipt of the samples, all raw processed sequence data from the assay of the Materials will made available to Collaborator in *.TSV format through the immunoSEQ Analyzer software platform for download and/or analysis. Subject to timely payment of the technology access fee, Adaptive will also provide basic level support for Collaborator's analysis of the samples provided (must be utilized within 30 days of notification of Project data availability; up to 5 hours of Adaptive personnel time) as set forth below. Adaptive may offer additional professional and analytical services for an additional fee.

Sequencing analysis may include:

- Identification and quantification of all clones in a given sample, including number of unique clones and frequency of each clone.
- Identification and comparison of common clones in all samples (between patients, and between pre-treatment and post-treatment samples for the same patient).
- Computation of V, D, and J usage in each sample.
- Comparisons of expansion of clones.
- Computation of the diversity and clonality of all samples.

(e) Results Sharing. Should Collaborator choose to share de-identified clinical data, Adaptive's bioinformatics team will also prepare analyses correlating clinical outcomes with sequencing data.

(f) Project Schedule. The parties anticipate that the activities contemplated by this Project Order will be completed over months, with the first samples expected to be shipped to Adaptive in_____ , 201__, and all sequencing completed and results delivered by ____, 201__.

2. PAYMENTS; INVOICING

(a) Invoicing. Adaptive will invoice Collaborator at the address set forth in the Agreement unless an alternate invoicing address is set forth below. All invoices will reference the applicable Collaborator purchase order number, if any.

Optional: alternate address for invoicing:

(b) Pricing. Services under this Project Order will be billed in accordance with the pricing set forth in the Agreement. The Parties agree that such compensation reflects the fair market value of the services rendered hereunder. Except for the payments by Collaborator as set forth below, each Party will be responsible for all costs and expenses it incurs related to the performance of this Project.

(c) Estimated Charges. The following table sets forth the estimated charges for the Project:

[INSERT TABLE]

(d) Estimated Payment Schedule: The following table sets forth the estimated payment schedule for the Project:

[***] [or] [***]

3. LONG-TERM ARCHIVING

☐ If this box is checked, the Materials and Collaborator Developments relating to this Project may be released to the public immunoSEQ data set along with the sequencing results (without attribution to Collaborator) upon the expiration of the confidentiality period described in Section 4

Certain information, as identified by [***], has been excluded from this agreement because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

Exhibit A - R&D POLICY PRINCIPLES

A. Ethical Conduct Requirements Ethical Conduct

Ethical Conduct

The Parties are committed to the highest standards of conduct in all aspects of their respective businesses and to conduct their business with honesty and integrity, and in compliance with all applicable legal and regulatory requirements.

- Always act with integrity and honesty and protect the Parties' public image and reputation in relationships with customers, competitors, suppliers, business partners and staff
- Promptly raise any concerns about possible unethical or illegal conduct
- Be free from actual or potential conflicts of interest that might influence, or appear to influence their judgment or actions when performing duties on behalf of the Parties
- The Parties' reputation and the respect of those who deal with the Parties must not be put at risk by acceptance of any entertainment, gifts or favours intended or perceived by others to influence their business judgment
- Communications with external audiences, i.e., investors and the media, should be managed through appointed company spokespersons to minimize risk to the Parties' reputation
- Provide accurate and reliable information in records submitted, safeguard the Company's confidential information, and respect the confidential information of other parties with whom the Company does business or competes
- Comply with all applicable anti-bribery practices legal requirements including U.S. Foreign Corrupt Practices Act ("FCPA") and the United Kingdom Bribery Act 2010. In particular no employee of either party shall give or authorize directly or indirectly any illegal payments to government officials of any country.
- Each employee of a Party should endeavour to deal fairly with the Company's customers, suppliers, competitors and employees. No-one should take unfair advantage of anyone through manipulation, concealment, abuse of privileged information, misrepresentation of material facts, or any other unfair-dealing practice.

B. Requirements for Engaging External Experts

Use of External Experts within R&D

The Parties believe that the engagement of external experts in R&D should be done In accordance with the following principles:

- There must be a legitimate need for the services of the expert that cannot be fulfilled in-house, and the minimum number of experts needed should be used
- Selection of experts should be based solely on the expert's qualifications and expertise in the subject matter for which such expert is retained
- The expert's services must be documented in a written signed agreement
- Compensation must be based on fair market value for the services provided
- Reimbursement or pre-payment for costs associated with travel, lodging, meals and hospitality (i.e. refreshments, background music at meetings) for an expert are acceptable if permitted by all law for the location in which the services are rendered and are modest in value
- Experts shall not receive any gifts of any value, especially where the expert is also a healthcare professional

- Gift includes anything of value, regardless of amount, given to show friendship, appreciation, or support, including meals, entertainment or recreational activities (excludes fair market value for services rendered).
- Healthcare Professionals includes, but is not limited to, physicians, their allied health professionals, and medical office staff. This term also applies to pharmacists and employees of pharmacy benefit managers.

Exhibit 10.5

1551 Eastlake Avenue East, Suite 200 • Seattle, WA 98102
P: 855.466.8667 W: adaptivebiotech.com

May 8, 2019

Viking Global Equities II LP
Viking Global Equities Master Ltd.
Viking Global Opportunities Illiquid Investments Sub-Master LP
Viking Long Fund Master Ltd.

55 Railroad Ave.
Greenwich, CT 06830
Attention: Katerina Novak
Email: legalnotices@vikingglobal.com

RE: Amended and Restated Standstill and Support Obligations

Reference is made to that certain letter agreement regarding standstill and support obligations by and among Viking Global Equities LP, Viking Global Equities II LP, VGE III Portfolio Ltd. and Viking Long Fund Master Ltd. (the "**Viking Purchasers**") and Adaptive Biotechnologies Corporation, a Washington corporation (the "**Company**"), dated as of December 11, 2017 (the "**Original Letter**"), which the Viking Purchasers and the Company entered into in connection with their execution of that certain Series F-1 Preferred Stock Agreement dated as of December 11, 2017 (the "**Series F-1 Purchase Agreement**").

Following execution of the Original Letter, certain of the Viking Purchasers transferred shares of the Company's capital stock held by such Viking Purchasers to certain affiliates of the Viking Purchasers, such that, as of the date hereof, all of the shares of the Company's capital stock previously held by the Viking Purchasers are now held by Viking Global Equities II LP, Viking Global Equities Master Ltd., Viking Global Opportunities Illiquid Investments Sub-Master LP, and Viking Long Fund Master Ltd. (collectively, the "**Viking Holders**").

Conditioned upon and effective as of the Company's consummation of its first underwritten public offering of its Common Stock (the "**Qualified IPO**"), this amended and restated letter regarding standstill and support obligations (this "**Restated Letter**") shall amend, restate and supersede in its entirety the Original Letter. Certain capitalized terms used in but not otherwise defined in this Restated Letter have the meanings ascribed to them in the Series F-1 Purchase Agreement or the Company's Seventh Amended and Restated Investors' Rights Agreement, dated on or about the date hereof, by and among the Company and the other parties thereto (the "**Investors' Rights Agreement**"), as applicable. Sections 7.2, 7.3, 7.4, 7.5, 7.6, 7.9, 7.10, 7.11 and 7.12 of the Series F-1 Purchase Agreement are incorporated herein by reference.

The Company and the Viking Holders hereby agree as follows:

1. Standstill and Support Obligations.

Each of the Viking Holders hereby agrees to abide by and comply with the standstill and support obligations set forth below in this Restated Letter, during the entire Standstill and Support Period (as defined in Section 1.4 below).

1.1 Restricted Activities. Each of the Viking Holders agrees that it will not, and will not cause or allow any Restricted Party to, take or attempt to take any of the following actions, unless and only to the extent that such actions have been approved in writing in advance by a majority of the members of the Company's Board of Directors then in office (who may withhold such approval for any or no reason, or may condition their approvals on any basis, in their sole discretion):

(a) acquire, offer to acquire or agree to acquire by purchase, tender offer, exchange offer, agreement, merger, business combination or any other manner (including by operation of law) beneficial ownership (as defined in Rule 13d-3 promulgated under the Exchange Act) of any additional shares or other securities of the Company (other than any Common Stock purchased in the Qualified IPO)); provided, that no Viking Holder shall be so restricted from acquiring additional shares or securities of the Company from the Company or from one of the other Purchasers;

(b) transfer any Shares or Common Stock issued upon conversion thereof, or any interest therein, to any person (other than one of the other Purchasers) if: (i) following such transfer, to the knowledge of the Viking Holder, the transferee, as well as any other persons acting with any of them as a "group" (within the meaning of Section 13(d) of the Exchange Act, and the rules promulgated thereunder) (collectively, the "Transferee Parties"), would have or hold beneficial ownership (as defined in Rule 13d- 3 promulgated under the Exchange Act) of over ten percent (10%) or more of the Company's outstanding capital stock (calculated on an as-converted basis), unless such transferee agrees in writing to be bound by the provisions of this Restated Letter to the same extent as the transferring Viking Holder; or (ii) the transferee or any of its Affiliates is, to the knowledge of such Viking Holder, a competitor of the Company, irrespective of whether the transfer would be permitted under clause (i) of this subsection; as used in this subsection, the term **"transfer"** means any sale, assignment, encumbrance, hypothecation, pledge, conveyance in trust, gift, transfer by bequest, devise or descent, or other transfer or disposition of any kind, whether voluntary or by operation of law, directly or indirectly, or by merger, including but not limited to distributions to partners or members or transfers to levying creditors, trustees or receivers in bankruptcy proceedings or general assignees for the benefit of creditors, but excluding any sales on a national securities exchange where the identity of the transferee is not known to or directed by the transferor; and the term **"competitor"** means companies engaged in development or application of next-generation sequencing; the Viking Holders acknowledge that the restrictions imposed by this subsection are in addition to the transfer restrictions imposed under Section 2.14 of the Investors' Rights Agreement; provided, that the transfer restrictions imposed by this subsection shall not apply (1) to any transfer by a Viking Holder to one of its Affiliates, so long as such Affiliate is not a competitor and agrees in writing to be bound by the provisions of this Restated Letter to the same extent as the transferring Viking Holder or a distribution-in-kind to one or more of such Viking Holder's direct or indirect limited partners, (2) to any transfer by a Viking Holder to one of the Key Holders (as defined in the Investors' Rights Agreement), (3) to any open market transaction arranged through a broker dealer as to which the Viking Holder has no knowledge that such transaction would be prohibited by clause (i) or (ii) of this subsection if it were effected privately, (4) to any transfer effected through a widely marketed public offering pursuant to a registration statement in connection with Section 2 of the Investors' Rights Agreement, (5) to any bona fide pledge to a financial institution, entered into in good faith and not for the purpose of avoiding the restrictions set forth in this Section 1.1, provided, that any sale or transfer upon foreclosure of such pledge is effected in a manner that would not violate this subsection 1.2(b) if effected by the Viking Holder, or (6) in case of clause (i) of this subsection, to a transfer that is a single transfer (or a series of related transfers) to the same Transferee Parties, none of the Transferee Parties, to the knowledge of such Viking Holder, is a competitor or is acquiring the Shares in order to take any actions that a Viking Holder would be prohibited from taking pursuant to Section 1.1 (c)-(e) of this Restated Letter, and (7) subject to Section 1.2, to any transfer in connection with a Corporate Event (as defined in Section 4.4(b)(ii) of the Restated Articles, as amended from time to time);

(c) make, vote for, encourage or support any proposal, to: (i) adopt any amendment or change to the Company's Bylaws that the Company's Board of Directors has recommended against; (ii) adopt or approve any shareholder proposal for consideration or action by shareholders, whether pursuant to Section 1.1.2 of the Company's Bylaws (or any equivalent successor provision), or by written consent solicitation, or otherwise that the Company's Board of Directors has recommended against; or (iii) approve any "significant business transaction" as such term is defined under RCW 23B.19.020(15), assuming for such purpose that the Company were subject to such provision and that one or more of the Restricted Parties were an "acquiring person" thereunder;

(d) enter into discussions with or encourage any third party with respect to commencement or conduct of a tender offer for shares of the Company's capital stock, or of a solicitation of any shareholder consent or proxy with respect to any matter, or of a campaign to influence the behavior of the Company's shareholders relative to any proposed tender or the subject of any shareholder vote; or call, seek to call or request the calling of, or encourage any third party to call or request the calling of, a special meeting of the Company's shareholders for the purpose of considering or acting upon any shareholder proposal or other item of business; or make a request for, or encourage any third party to make a request for, a list of the Company's shareholders for the purpose of soliciting shareholder support for any proposal or otherwise influencing the behavior of the Company's shareholders; or

(e) form, join in or in any way participate in a "group" (as defined in Section 13(d) of the Exchange Act, and the rules promulgated thereunder), and including without limitation depositing any shares of the Company's capital stock in a voting trust or entering into a voting agreement, proxy or pooling arrangement) for the purpose of acting in a concerted manner with respect to buying, selling or voting shares of the Company's capital stock or influencing the management of the Company or the decision-making of its Board of Directors; provided, that this subsection shall not restrict the Viking Holders from entering into any such arrangements among themselves or with any of their Affiliates (other than a competitor, as defined in Section l.l(b) above), or from engaging in conversations with the Company's management and Board of Directors or granting proxies to the Company's management pursuant to Board-approved proxy solicitations;

provided, however, that nothing in this Section 1.1 shall restrict or limit in any respect the ability of any of the Viking Holders to exercise any rights pursuant to Sections 4 or 5 of the Investors' Rights Agreement.

1.2 Required Support. Each of the Viking Holders agrees that, in all shareholder meetings and shareholder consent solicitations occurring during the Standstill and Support Period, it will cause all Shares, Common Stock and other shares of the Company's voting capital stock that it legally or beneficially owns to be voted as follows:

(a) in favor of any proposal that (i) has been recommended by the Company's Board of Directors and (ii) relates to a transaction that would constitute a Corporate Event, but only, at the option of the Viking Holder, (x) as recommended by the Company's Board of Directors or (y) in the same proportions as all other shareholders of the Company voting on such proposal.

(b) Each Viking Holder hereby constitutes and appoints the Company's Chief Executive Officer, with full power of substitution, as the proxy of such Viking Holder with respect to the matters set forth herein, and hereby authorizes the Company's Chief Executive Officer to represent and to vote all of such party's Shares in accordance with the terms and provisions of this Restated Letter, but if and only if the party (i) fails to vote as required under, or (ii) attempts to vote (whether by proxy, in person or by written consent) in a manner that is inconsistent with, the terms of this Restated Letter. The proxy granted pursuant to the immediately preceding sentence is given in consideration of the agreements

and covenants of the Company and the parties in connection with the transactions contemplated by the Series F-1 Purchase Agreement and this Restated Letter and, as such, is coupled with an interest and shall be irrevocable unless and until the termination of the Standstill and Support Period pursuant to Section 1.4. Each Viking Holder hereby revokes any and all previous proxies with respect to the Shares and shall not hereafter, unless and until the termination of the Standstill and Support Period pursuant to Section 1.4, purport to grant any other proxy or power of attorney with respect to any of the Shares, deposit any of the Shares into a voting trust or enter into any agreement (other than this Restated Letter and the Series F-I Purchase Agreement), arrangement or understanding with any person, directly or indirectly, to vote, grant any proxy or give instructions with respect to the voting of any of the Shares, in each case, with respect to any of the matters set forth herein.

1.3 Standstill and Support Period. The restrictions and obligations imposed by this Restated Letter shall continue in force until the earlier of (a) the consummation of a Corporate Event, (b) April 3, 2024, and (c) the date that the Viking Holders collectively cease to have beneficial ownership (as defined in Rule 13d-3 promulgated under the Exchange Act) of at least 10% of any class of voting securities of the Company (such period, the **"Standstill and Support Period"**).

1.4 During the Standstill and Support Period, the terms of this Restated Letter shall not be subject to amendment except upon the written agreement of (i) each and all of the Viking Holders (and their Affiliates who have become parties hereto in accordance with the proviso to Section 1.1(b) above) and (ii) the Company pursuant to authorization by its Board of Directors.

1.5 Equitable Relief. Each Viking Holder acknowledges and agrees that the Company will be irreparably damaged in the event any of the provisions of this Restated Letter are not performed by such Viking Holder in accordance with their specific terms or are otherwise breached. Accordingly, it is agreed that the Company shall be entitled to an injunction to prevent breaches of this Restated Letter, and to specific enforcement of this Restated Letter and its terms and provisions in any action instituted in any federal or state court located in the State of Washington, which the parties agree shall have exclusive jurisdiction over any such equitable or enforcement actions hereunder.

1.6 Integration. Sections 1.1, 1.2, 1.4 and 1.5 of that certain letter agreement, dated as of May 5, 2015, by and between the Company and the Viking Holders (the **"Series F Side Letter"**), Sections 6.1, 6.2, 6.4 and 6.5 of that certain Series E Preferred Stock Purchase Agreement dated as of December 20, 2014, by and between the Company and the purchasers listed on Exhibit A thereto (the **"Series E Purchase Agreement"**), and Sections 6.1, 6.2, 6.4 and 6.5 of that certain Series D Preferred Stock Purchase Agreement dated as of April 3, 2014, by and between the Company and the purchasers listed on Exhibit A thereto (the **"Series D Purchase Agreement"**), are hereby amended and restated in their entirety to read as set forth in Section 1.1, 1.2, 1.4 and 1.5 of this Restated Letter, except that references to "Shares" in Section 1.1, 1.2, 1.4 and 1.5 of the Series F Side Letter shall be deemed to refer to the shares of the Company's Series F Preferred Stock purchased in connection with the parties entry into the Series F Side Letter, references to "Shares" in Section 6.1, 6.2, 6.4 and 6.5 of the Series E Purchase Agreement shall be deemed to refer to the shares of the Company's Series E Preferred Stock purchased thereunder, and references to "Shares" in Section 6.1, 6.2, 6.4 and 6.5 of the Series D Purchase Agreement shall be deemed to refer to the shares of the Company's Series D Preferred Stock purchased thereunder. The parties hereto hereby acknowledge and agree that the transactions contemplated by this Restated Letter have been approved in writing in advance by a majority of the members of the Company's Board of Directors then in office pursuant to Section 1.4(ii) of the Original Letter, Section 1.1(a) of the Series F Side Letter and Section 6.1(a) of the Series E Purchase Agreement and the Series D Purchase Agreement.

1.7 Definitions. For purposes of this Restated Letter, the following terms have the following meanings:

(a) **"Affiliate"** has the meaning set forth in Rule 12b-2 promulgated under the Exchange Act.

(b) **"Exchange Act"** means the Securities Exchange Act of 1934, as amended.

(c) **"Permitted Affiliate"** means an Affiliate of a Viking Holder as to which such Viking Holder does not, at the relevant time, control a majority of the board of directors or similar governing body of the Affiliate (regardless of whether the Viking Holder has the ability or right to so control in the future or has controlled at any time prior to the relevant time) and does not actively oversee or significantly influence the Affiliate's voting or dispositive decisions with respect to any securities of the Company held or that may be acquired by such Affiliate.

(d) **"Restricted Party"** means any Viking Holder, any Relevant Viking Affiliate, or any officer, director, manager, member, partner, employee or agent of such Viking Holder or Relevant Viking Affiliate.

(e) **"Relevant Viking Affiliate"** means an Affiliate of a Viking Holder other than a Permitted Affiliate.

[*Signature pages follow.*]

IN WITNESS WHEREOF, the Company and the Viking Holders have executed this Restated Letter as of the date first written above.

ADAPTIVE BIOTECHNOLOGIES CORPORATION

By: /s/ Chad Robins
Name: Chad Robins
Title: Chief Executive Officer

Acknowledged and Agreed:

VIKING GLOBAL EQUITIES II LP

By: Viking Global Performance LLC
Its: General Partner

By: /s/ Matthew Bloom
Name: Matthew Bloom
Title: Authorized Signatory

VIKING GLOBAL EQUITIES MASTER LTD.

By: Viking Global Performance LLC
Its:

By: /s/ Matthew Bloom
Name: Matthew Bloom
Title: Authorized Signatory

VIKING GLOBAL OPPORTUNITIES ILLIQUID INVESTMENTS SUB-MASTER LP

By: Viking Global Opportunities Portfolio GP LLC
Its: Investment Manager

By: /s/ Matthew Bloom
Name: Matthew Bloom
Title: Authorized Signatory

VIKING LONG FUND MASTER LTD.

By: Viking Long Fund GP LLC
Its: Investment Manager

By: /s/ Matthew Bloom
Name: Matthew Bloom
Title: Authorized Signatory

Exhibit 10.6

MASTER SERVICES AGREEMENT

THIS MASTER SERVICES AGREEMENT (the "Agreement") effective this 5th day of August, 2015 (the "Effective Date"), is made and entered into by and between **Adaptive Biotechnologies Corporation**, a Washington corporation having a business address at 1551 Eastlake Avenue East, Suite 200 Seattle, WA 98102, on behalf of itself and its subsidiaries (together with its subsidiaries, "Client"), and **ZS Associates, Inc.** ("Contractor"), an Illinois corporation having a business address at 400 South El Camino Real, Suite 1500, San Mateo, CA 94402, USA. Client and Contractor may each be referred to individually as a "Party" and collectively as the "Parties".

WHEREAS, Contractor has certain skills and knowledge and as such, is well suited to perform services for Client as further set forth herein; and

WHEREAS, Client desires that Contractor perform certain services for Client and Contractor desires to provide such services to Client.

NOW THEREFORE, in consideration of the mutual obligations specified in this Agreement, the Parties agree to the following:

1. Services Engagement. Client hereby engages and Contractor accepts such engagement to perform the Services as specified from time to time on work orders in a form substantially similar to that attached hereto as Appendix A and signed by both Parties (each a "Work Order").

a. Services. Subject to other terms of this Agreement, Contractor shall provide services ("Services") in connection with one or more projects (each a "Project and collectively, the "Projects") as detailed in a Work Order document during the Term of this Agreement. Each Work Order shall set forth, at a minimum, (a) the specific project, meeting or other services to be performed or provided by Contractor, (b) the deliverables to be provided to Client in connection therewith, (c) the timeline for project milestones, (d) the term during which the Services will be provided (the "Project Term"), (e) a budget and (f) a payment schedule. To the extent that a project involves the provision of fees or benefits to a health care professional ("HCP"), the Work Order shall include a summary of approved (i) fair market-based participant fees and/or expenses (if any); and (ii) HCP contract template to be used with participants. Each Work Order shall include an express reference to this Agreement and shall be signed by authorized representatives of Contractor and Client. In the event of a conflict between this Agreement and any Work Order, the terms of this Agreement shall govern, except to the extent that the applicable Work Order expressly and specifically states an intent to supersede the Agreement on a specific matter. Any changes in the general scope of a Project, whether initiated by Client or Contractor, must be made in writing and accepted by the Parties, If the Parties believe that an adjustment to compensation or any scheduled completion dates is justified as a result of a significant change, the Parties will negotiate in good faith and agree to an adjustment to the Work Order (a "Change Order"), Each Change Order shall detail the agreed changes to the applicable task, responsibility, duty, pricing, time line or other matter, The Change Order will become effective upon the execution of the Change Order by both Parties, and shall be made part of this Agreement and the applicable Work Order. Contractor shall not incur any costs or

modify its performance of the Services based on the modifications set forth in a Change Order unless and until such Change Order is executed by the Parties or Client has otherwise authorized Contractor to begin performing the modified Services.

The Services performed under this Agreement shall be performed by employees or consultants provided by Contractor. Contractor understands and agrees that it is required to perform the Services (and any changes to the Services) with professional skill and care in the orderly progress of the Services. Affiliates of Client and Contractor may adopt this Agreement by entering into Work Orders under the Agreement. In such cases, all references in this Agreement to Client or Contractor, respectively, shall be deemed to be to the applicable affiliate of Client or Contractor, respectively.

b. Performance and Time Commitment. Contractor shall render the Services at such times and for the duration as may be set forth in a Work Order.

c. Professional Standards. The manner and means used by Contractor to perform the Services desired by Client are at the sole discretion and control of Contractor. Contractor's Services, and the result thereof, will be performed with and be the product of a high degree of professional skill and expertise and in conformance with all applicable federal and state laws, rules, regulations and guidelines ("Applicable Laws"). If, for any reason, Contractor personnel performing Services under this Agreement fail or are unable to perform the Services required hereunder to Client's reasonable satisfaction, Client shall provide Contractor with written notice setting forth the nature and extent of Client's issue and Contractor shall remove the personnel from Client's Project as soon as reasonably possible and shall replace the personnel with another personnel of equivalent experience and qualifications,

d. Independent Contractor Status. It is understood and agreed that Contractor is an independent contractor, is not an agent or employee of Client, and is not authorized to act on behalf of Client. Contractor agrees not to hold out as, or give any person any reason to believe that Contractor is, an employee, agent, joint venture or partner of Client. Contractor will not be eligible for any employee benefits, nor will Client make deductions from any amounts payable to Contractor of taxes or insurance. All payroll and employment taxes, insurance, and benefits shall be the sole responsibility of Contractor. Contractor retains the right to provide services for others during the term of this Agreement.

2. Compensation. As compensation for Contractor's Services and the discharge of all Contractor's obligations hereunder, Client shall pay Contractor fees in the amount and according to the schedule agreed upon by the Parties and as stated in the applicable Work Order. Amounts outlined in the applicable Work Order will not be adjusted without prior written approval of Client through a Change Order. Pass-through expenses exceeding specific amounts that may be set forth in a Work Order will not be adjusted without prior written approval of Client.

During the term of this Agreement, Contractor will invoice Client in accordance with the compensation or payment provisions set forth in Work Order using an invoice format to be mutually agreed upon by the Parties. Client shall pay each invoice within thirty (30) days of the date of the invoice. If an undisputed invoice is not paid within thirty (30) days of the date of the

invoice, Contractor may impose a finance charge of 1.0% monthly, applied to the outstanding balance due. If any portion of an invoice is disputed, then Client shall pay the undisputed amounts as set forth in the preceding sentence and shall provide Contractor with written notice setting forth the basis of the disputed invoice. The Parties shall use good faith efforts to reconcile the disputed amount as soon as practicable. If it is ultimately determined that the disputed amount should not have been paid by Client, Contractor shall refund the amount being due to Client.

3. Expenses. Client shall reimburse Contractor for all reasonable expenses actually incurred by Contractor in performing the Services, including shipping, postage, federal express, supplies, copying and other printing as long as such expenses are reasonable and necessary and are set forth in a Work Order. Contractor shall maintain adequate books and records relating to any expenses to be reimbursed and shall submit requests for reimbursement in a timely manner.

In addition to Contractor compensation, Contractor shall, in accordance with the provisions set forth herein, be entitled to reimbursements for approved travel and other related expenses reasonably and properly incurred by Contractor in connection with Contractor's performance of the Services (the "Reimbursable Expenses"). Reimbursable Expenses may not include any increased mark-up, burden, or uplift. No expenses beyond those specified in the applicable Work Order and within the approved budget stated therein shall be incurred without the Client's prior written approval. All requests for reimbursement for expenses shall be set forth in an invoice.

Invoices for direct Contractor expenses are not required to include a breakdown of fees by person, copies of receipts of expenses nor an itemization of individual time records or expense items. Documentation of expenses will be retained by Contractor and made available for inspection at Contractor's offices upon request during normal business hours. Invoices shall be sent to the following: Adaptive Biotechnologies Corporation, Attn: Accounts Payable, 1551 Eastlake Avenue East, Suite 200, Seattle, WA 98102. Soft copies of invoices may be submitted to: ap@adaptivebiotech.com.

4. Maintaining Confidential Information.

a. Client Information. During the term of this Agreement, each Party (a "Receiving Party") may receive or otherwise be exposed to confidential and proprietary information relating to the other Party's (the "Disclosing Party") technology, know-how, software and tools, data, inventions, developments, plans, templates, forecasts, business practices or finances, clinical trials, chemical synthesis, methods of purification, compositions of matter and uses thereof, strategies, pricing, analytical techniques, methodologies and processes utilized to provide the Services. Such confidential and proprietary information (collectively referred to as "Confidential Information") includes, but is not limited to, (i) confidential and proprietary information supplied by the Disclosing Party to the Receiving Party (including, but not limited to, those marked with the legend "Client Confidential", "Contractor Confidential" or equivalent), (ii) the Disclosing Party's marketing and customer support strategies, financial information (including sales, costs, profits and pricing methods), internal organization, employee information, and customer lists, (iii) the technology owned by or licensed to the Disclosing Party, including discoveries, inventions, research and development efforts, chemical synthesis,

methods of purification, compositions of matter and uses thereof, data, software, trade secrets, processes, samples, media and/or cell lines (and procedures and formulations for producing any such samples, media and/or cell lines), vectors, viruses, assays, plasmids, formulas, methods, product and know-how and show-how, (iv) all derivatives, improvements, additions, modifications, and enhancements to any of the above, including any such information or material created or developed by Contractor under this Agreement, if derived from the Confidential Information and (v) information of third parties as to which the Disclosing Party has an obligation of confidentiality (provided Disclosing Party notifies Receiving Party of same).

The term "Confidential Information" shall not be deemed to include information which can be demonstrated by competent written proof (a) is now, or hereafter becomes, through no act or failure to act on the part of the Receiving Party, generally known or available, (b) is known by the Receiving Party at the time of receiving such information, as evidenced by its records, (c) is hereafter furnished to the Receiving Party by a third party, as a matter of right without restriction on disclosure, (d) was independently developed by the Receiving Party without use of or reference to the Disclosing Party's Confidential Information, and Receiving Party has documentation of such independent development, or (e) is the subject of a written permission to disclose provided by the Disclosing Party.

Receiving Party acknowledges the confidential and secret character of Disclosing Party's Confidential Information and agrees that such Confidential Information is the sole, exclusive and extremely valuable property of the Disclosing Party. Accordingly, Receiving Party agrees not to reproduce any of the Confidential Information without the applicable prior written consent of the Disclosing Party, not to use such Confidential Information except in the performance of this Agreement, and not to disclose all or any part of the Confidential Information in any form to any third party except to its employees, affiliates, and contractors that are not competitors of the Disclosing Party, either during the term of this Agreement and after the termination or expiration of this Agreement for such time as the Confidential Information remains confidential and/or proprietary. Upon Disclosing Party's request and expense, Receiving Party agrees to cease using and return to the Disclosing Party all whole and partial copies and derivatives of the Disclosing Party's Confidential Information, whether in its possession or under its direct or indirect control, except copies that are legally required to be maintained. The Receiving Party shall be permitted to keep a limited number of backup copies as have been automatically created and archived by the Receiving Party's standard backup processes and systems for information security purposes, provided however that any such backup copies shall always be subject to confidentiality obligations set forth hereunder.

Notwithstanding any other provision of this Agreement, disclosure of the Confidential Information will not be precluded if such disclosure is in response to a valid order of a court or other governmental body of the United States; provided, however, that the Receiving Party shall give the Disclosing Party sufficient advance written notice to enable the Disclosing Party to seek a protective order or other remedy to protect such Confidential Information, and provided further that the Receiving Party may disclose only the minimum Confidential Information required to be disclosed, whether or not a protective order or other remedy is in place. If the Disclosing Party is, but the Receiving Party is not, a party to or subject of the judicial or administrative action that gives rise to such disclosure requirement, then the costs of any efforts by the Receiving Party to limit disclosure and of any subsequent production shall be borne by the Disclosing Party.

b. Other Employer Information. Contractor will not, during Contractor's engagement with Client, improperly use or disclose any proprietary information or trade secrets of Contractor's former or current employers or companies (without consent), if any, and Contractor will not bring onto the premises of Client any unpublished documents or any property belonging to Contractor's former or concurrent clients unless consented to in writing by said clients.

c. Third Party Information. Each Party recognizes that the other Party has received and in the future will receive confidential or proprietary information from third parties and is subject to a duty to maintain the confidentiality of such information and, in some cases, to use it only for certain limited purposes. Each Party agrees that it owes the other Party and such third parties, both during the term of Contractor's engagement and thereafter, a duty to hold all such confidential or proprietary information in confidence in accordance with the terms hereof and not to disclose it to any person, firm or corporation (except in a manner that is consistent with the Party's agreement with such third party) or use it for the benefit of anyone other than the Party receiving such confidential or proprietary information from the third party or such third party.

5. Services Product.

a. Disclosure of Inventions. Contractor shall disclose to Client any and all ideas, improvements, inventions, techniques and works of authorship learned, conceived or developed by Contractor, specifically and directly related to Contractor's Services for Client during Contractor' retention hereunder and which are specifically identified as deliverables in the Work Order but excluding any Contractor Materials, except in those circumstances where the Word Order indicates that the deliverables will be licensed separately (the "Services Product"). Contractor' obligation to disclose Services Product shall be satisfied by Contractor providing Client with any deliverable required pursuant to a Work Order.

b. Services Product Assigned to Client. Subject to Section 5(d) below, Contractor agrees that any and all Services Product(s) shall be the sole and exclusive property of Client. Upon payment of the applicable fees and expenses, Contractor shall assign to Client all Contractor's rights, title and interests in and to any and all Services Product(s).

c. Obtaining Intellectual Property Protection. Contractor agrees to assist Client in every proper way to obtain and enforce United States and Foreign proprietary rights relating to the Services Product in any and all countries as reasonably requested by Client. To that end, at Client's expense, Contractor agrees to execute, verify and deliver such documents and perform such other acts as Client may reasonably request for use in applying for, obtaining, perfecting, evidencing, sustaining and enforcing such proprietary rights and the assignment thereof. In addition, Contractor agrees to execute, verify and deliver assignments of such proprietary rights to Client or its designee. Contractor's obligations to assist Client with respect to proprietary rights in any and all countries shall continue beyond the termination of Contractor's engagement, but Client shall compensate Contractor for all costs and fees incurred (including but not limited to reasonable attorney fees) for the time actually spent and costs incurred by Contractor at Client's request on such assistance.

d. Notwithstanding anything to the contrary set forth herein, to the extent any Services Product includes Contractor's concepts, ideas, models, know-how, software, methodologies, technology, techniques, procedures, survey questions, Contractor benchmarking studies and data, management tools, workshops, manuals, macros, data files, inventions, templates, and other intellectual capital and property rights therein that Contractor has used, developed, created or acquired (including the right to license third party software to its clients) prior to, or independent of, performing Services under this Agreement and any Work Order hereunder or in the course of providing such Services unless specifically identified as a deliverable in the applicable Work Order, and does not contain Client's Confidential Information (the "Contractor Materials"), Contractor shall retain exclusive ownership in such Contractor Materials. Upon payment of the applicable invoice, Contractor hereby grants Client a limited, non-exclusive, non-transferable (except to affiliates or successors), perpetual, royalty-free, worldwide, irrevocable license for it to use the Contractor Materials solely in connection with its use of the Services Product created by Contractor in connection with the Services.

6. Term/Termination/Expiration. Either Party may terminate this Agreement or any applicable Work Order at any time by giving the other Party at least thirty (30) days prior written notice. Either Party may terminate this Agreement immediately upon written notice to the other Party if: (a) the other Party commits a material breach of this Agreement, which is not cured within thirty (30) days of receipt of notice of the breach, or (b) immediately upon written notice if the other Party becomes insolvent, is dissolved or liquidated, makes general assignment for the benefit of its creditors, files or has filed against it a petition for bankruptcy, or has a receiver appointed for a substantial part of its assets. Contractor may also terminate this Agreement (and any Work Order) if any undisputed payment to Contractor by Client is not made when due and such payment is not made within thirty (30) days from the date of written notice from Contractor to Client of such nonpayment.

This Agreement shall expire two (2) years after the Effective Date or, if later, concurrently with the latest termination effective date or expiration date of any applicable Work Order, Sections 4 and 5 of this Agreement shall survive any termination of this Agreement, Upon termination or expiration of this Agreement or an applicable Work Order, all unpaid charges for Services rendered, expenses incurred or advanced through the termination or expiration date and reasonable non-cancelable obligations incurred for the Services by Contractor to the termination or expiration date shall be paid by Client within thirty (30) days. Any amounts prepaid by Client for Services not yet rendered or expenses not yet incurred prior to the termination or expiration date shall be refunded by Contractor to Client within thirty (30) days of the termination or expiration date. Upon either Party's request and expense on termination or expiration, each Party shall return to the other Party all Confidential Information and materials from the other Party in its possession, subject to Section 4(a), and Contractor shall provide any completed Services Product to Client.

7. Audits. Client shall have the right once per calendar year during normal business hours, with reasonable prior advance written notification to Contractor, to audit Contractor's books and records as they directly pertain to the Services. Contractor shall maintain all records

and accounts pertaining to the Services performed for a period of one (1) year after final payment by Client of Contractor's invoice. All records and accounts relating to financial matters shall be kept in reasonable condition consistent with the practices of similar companies similarly situated. Client shall be solely responsible for all costs and fees associated with audits conducted pursuant to this Section 7. Such audit will be subject to Contractor's obligations of confidentiality to its employees and other clients, shall not unreasonably interfere with Contractor's business activities, and if performed by a third party, shall be subject to such auditor entering into an appropriate confidentiality agreement with Contractor and shall not be performed by a competitor of Contractor.

8. Subcontractors. Except as may be otherwise set forth in a Work Order, Contractor may subcontract any of the services to be performed by it under this Agreement with Client's prior written consent (which consent shall not be unreasonably withheld or delayed), provided however that Contractor shall be permitted to utilize employees of its affiliates and temporary personnel to provide services without obtaining prior consent of Client. Identification of a subcontractor relationship in a Work Order executed by both parties shall constitute approval of use of the subcontractors. If Client does so consent, Contractor shall remain liable for the performance of any of its obligations hereunder that it delegates to a subcontractor.

9. Compliance With Applicable Laws. Contractor warrants that all material supplied and Services performed under this Agreement complies with or will comply with Applicable Laws, including, but not limited to, all applicable privacy and data protection laws. Contractor shall protect as required by applicable law any data that may become accessible to Contractor when performing the Services against disclosure to any unauthorized third party and shall use data only for the provision of its Services hereunder and for no other purpose. Contractor shall report to Client any breach of the requirements under this paragraph that it identifies. Client warrants that it shall use any deliverable provided by Contractor pursuant to a Work Order only in accordance with and for purposes that comply with all Applicable Laws, Each Party further warrants that neither it nor any of its officers, directors, employees, or agents is presently debarred pursuant to the Federal Food, Drug, and Cosmetic Act and, to the best of such Party's knowledge, neither it nor any of its officers, directors, employees, or agents is presently under investigation by the United States Food & Drug Administration for any debarment action pursuant to the Federal Food, Drug, and Cosmetic Act. Each Party shall notify the other Party within a reasonable period of time after such Party receives any inquiry or learns of the commencement of any such proceeding regarding such Party or any of its officers, directors, employees, or agents.

10. Representation/Warranty.

a. Contractor represents and warrants that none of the Services and/or materials provided under this Agreement infringes the intellectual property rights of a third party, or, if so, that Contractor has the appropriate license to use such intellectual property as related to Services and/or materials as required to carry out its obligations under this Agreement. Further, Contractor represents and warrants that it is properly licensed, qualified, equipped, organized and financed to perform the Services and will do so in compliance with all applicable laws and regulations, and that Contractor's performance of the Services and compliance with this Agreement do not breach or conflict with any other agreement, whether written or oral, entered into by Contractor. Contractor warrants that the person signing this Agreement on behalf of Contractor has the power and authority to execute this Agreement.

b. Client represents and warrants as follows:

i. Client materials. Client owns or has all necessary lawful authority to use the trademarks used by Client in its products and in furtherance of marketing and selling its products. Client represents and warrants that none of the materials provided under this Agreement to Contractor infringes the intellectual property rights of a third party, or, if so, that Client has the appropriate license to use such intellectual property as related to the materials as required for either Party to carry out its obligations under this Agreement. If Client provides any data or information to Contractor that includes any third party data or information, Client hereby represents and warrants that it is authorized to provide Contractor with such data and information for use in connection with the applicable Work Order. Further, Client represents and warrants that Client's performance of its obligations under, and compliance with, this Agreement do not breach or conflict with any other agreement, whether written or oral, entered into by Client. Client warrants that the person signing this Agreement on behalf of Client has the power and authority to execute this Agreement

ii. Compliance with Laws. Client shall ensure all materials, documentation and information provided by it to Contractor are in compliance with all Applicable Laws.

iii. Client shall cooperate with Contractor in Contractor's performance of Services hereunder and shall be responsible for the performance of Client's personnel and agents. The decision to implement any or all of Contractor's recommendations shall be the responsibility of Client. Client shall be responsible for the accuracy and completeness of all data and other information it provides to Contractor.

11. Indemnification.

Indemnification by Contractor. Contractor agrees to indemnify, defend and hold harmless Client, its officers, directors, or employees, or agents from and against any and all third party liability, damages, loss or expense (including reasonable attorneys' fees and expenses of litigation) (collectively "Losses") to the extent caused by: (i) a material breach of Contractor's obligation to provide Services in accordance with this Agreement, or (ii) a claim by a third party that alleges that Contractor's Services, Services Product or material infringes a third party intellectual property right; (iii) Contractor's grossly negligent acts or omissions relating to its obligations hereunder, or (iv) Contractor's willful misconduct or material breach of any representation, warranty or obligation hereunder, except to the extent such Losses arise out of the negligence or willful misconduct by Client. All indemnification rights described in this provision are expressly conditioned upon Client giving to Contractor prompt and timely notice of the claim for which indemnification is sought, sole authority to conduct the defense of the claim (including, without limitation, choice of legal counsel and settlement authority), though Contractor will not settle any claims requiring admission of fault or contribution by Client without the consent of Contractor, and all rights under counterclaims and defenses accruing to Client. In the event an infringement claim arises as a result of Client's use of deliverables

provided by Contractor under an applicable Work Order, or if Contractor reasonably believes that such a claim is likely to be made, Contractor, at its option and in lieu of indemnification, may: (i) modify the applicable deliverables so that they become non-infringing but still comply with the applicable specifications set forth in the Work Order; or (ii) replace the applicable deliverable with non-infringing functional equivalents; or (iii) obtain for Client the right to use such deliverable upon commercially reasonable terms at Contractor's sole expense; or only if the three preceding remedies prove impractical or commercially impracticable, then (iv) remove the infringing or violating deliverables and refund to Client the fees paid for such deliverables that are the subject of such a claim less 20% for each year Client has had the use of such deliverables. Contractor shall have no obligation under this section or other liability for any infringement or misappropriation claim resulting or alleged to result from. (1) use of the deliverables in combination with any equipment or software not approved for use by Contractor; (ii) any claim arising from any instruction, information, design or other materials furnished by Client to Contractor hereunder; or (iii) Client continuing the allegedly infringing activity after being notified thereof or after being informed and provided with modifications that would have avoided the alleged infringement.

Indemnification by Client. Client agrees to indemnify, defend and hold harmless Contractor, its officers, directors, employees, or agents from and against any Losses arising out of: (i) a claim by a third party that alleges that information or material provided by Client infringes a third party's intellectual property right, (ii) Client's negligent acts or omissions relating to its obligations hereunder, or (iii) Client's willful misconduct or breach of any representation, warranty or obligation hereunder, except to the extent such Losses arise out of the negligence or willful misconduct of Contractor.

12. Limitation of Liability. IN NO EVENT SHALL EITHER PARTY, ITS DIRECTORS, OFFICERS, EMPLOYEES, AFFILIATES OR REPRESENTATIVES BE LIABLE TO THE OTHER PARTY FOR ANY INDIRECT, INCIDENTAL, SPECIAL, PUNITIVE, EXEMPLARY OR CONSEQUENTIAL DAMAGES, WHETHER BASED UPON A CLAIM OR ACTION OF CONTRACT, WARRANTY, NEGLIGENCE, STRICT LIABILITY OR OTHER TORT, OR OTHERWISE, ARISING OUT OF THIS AGREEMENT_ EACH PARTY DISCLAIMS ANY AND ALL OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE WARRANTIES OF DESIGN, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE. FOR CLARIFICATION, THIS LIMITATION SHALL NOT APPLY TO THE PARTIES INDEMNIFICATION OBLIGATIONS SET FORTH IN SECTIONS 11 OR 12 ABOVE. Client and Contractor agree that, to the fullest extent permitted by law, each party's liability to the other for any and all claims, losses, costs, damages of any nature whatsoever or claims expenses, including attorneys' fees, arising out of the Services, the Services Product, or this Agreement, shall be limited to two times (2x) the amount of professional fees paid or payable in connection with the Services giving rise to the claim.

13. Legal and Equitable Remedies. Each Party hereby acknowledges and agrees that in the event of any actual or threatened disclosure of Confidential Information or Services Product without the prior express written consent of the other Party, each Party will suffer an irreparable injury, such that no remedy at law will afford it adequate protection against, or appropriate compensation for, such injury. Accordingly, the Parties hereby agree that each Party, in addition to any other remedies available to it at law or in equity, may be entitled to seek to obtain injunctive relief to enforce the terms of this section.

14. No Referral or Product Use Requirement Reporting. Client complies with all applicable laws and regulations ("Applicable Laws") in specifying, participating in, or using the results of the Services, and endorses the principles and ethical standards promulgated by the Pharmaceutical Research and Manufacturers of America (PhRMA) known as the PhRMA Code on Interactions with Healthcare Professionals (and all revisions thereto). The Parties hereto intend to conduct any engagements under this Agreement in compliance with the American Medical Association's Guidelines on Gifts to Physicians from Industry. The Parties hereto acknowledge that the compensation paid hereunder has been determined through good faith and arms-length negotiation to be the fair market value of the Services rendered. No amount paid or reimbursed hereunder is intended to be, nor shall it be construed as, an offer or payment made, whether directly or indirectly, to induce the referral of patients or members, to purchase, lease or order of any item or service, or the recommending or arranging for the purchase, lease or order of any item or service provided, manufactured or distributed by Client. Contractor further acknowledges and agrees that Client has the right to disclose any and all compensation paid to Contractor pursuant to Client's obligations under any Applicable Laws and that Contractor will provide Client with any information with respect to payments and pass-through expenses under this Agreement required to fulfill Client's reporting obligations under Applicable Laws.

15. Governing Law; Severability. If any provision of this Agreement is found by a court of competent jurisdiction to be unenforceable, that provision shall be severed and the remainder of this Agreement shall continue in full force and effect.

16. Assignment; Benefit. This Agreement is for the Services to be provided by Contractor and may not be assigned by either Party, without prior written consent of the other Party. Notwithstanding the above, either Client or Contractor may assign or transfer its rights, duties and obligations as part of an acquisition or purchase of Client or Contractor, as the case may be, without the prior written consent of the other Party when the assignment is to an affiliate under common control. Any permitted assignment of this Agreement and the rights and/or obligations hereunder will be in writing (satisfactory in form and substance to the other Party), and any permitted successor or assignee will expressly assume this Agreement and any existing Work Order and the rights and obligations hereunder and thereunder. The Parties' rights and obligation under this Agreement will bind and inure to the benefit of their respective successors, heirs, executors, and administrators and permitted assigns.

17. Notices. Any notices required or permitted hereunder shall be given to the appropriate Party at the address specified below or at such other address as the Party shall specify in writing. Such notice shall be deemed given upon personal delivery to the appropriate address to be sent by overnight delivery, the next business day or certified or registered mail, three days after the date of mailing.

If to Client:
Adaptive Biotechnologies Corp.
1551 Eastlake Avenue East Suite 200
Seattle, WA 98102
Attention: General Counsel
Fax: (206)

If to Contractor:
ZS Associates, Inc.
400 South El Camino Real,
Suite 1500, San Mateo, CA 94402, USA
Attention: Steve Love, Principal
Fax:

With a copy to:
ZS Associates
1800 Sherman Avenue, Suite 700
Evanston, IL 60201
Fax: 847-492-3556
Attention: Senior Legal Counsel

18. Insurance. Each Party undertakes to maintain appropriate levels of insurance in commercially reasonable amounts with financially capable carriers and/or through self-insurance programs as is customary in their respective industry for the programs and activities to be conducted by it and/or as a result of the Services and shall maintain adequate levels of insurance to satisfy its respective obligations under this Agreement Each Party shall provide the other Party with a certificate of insurance upon request.

19. Use of Name, Press and News Releases. Each Party agrees not to use the name, emblem, logo or marks of the other Party to this Agreement in any advertising, press or news release, or other publication or public statement, nor disclose the existence of the relationship or the fact of this Agreement, without the prior written consent of the other Party, except as required by law.

20. Complete Understanding/ Modification/ Counterparts. This Agreement (and any Work Order) constitutes the final, exclusive and complete understanding and agreement of Client and Contractor with respect to the subject matter hereof Any waiver, modification or amendment of any provision of this Agreement shall be effective only if in writing and signed by a Client officer. This Agreement (and any Work Order) may be executed in any number of counterparts, each of which shall be an original and all of which together shall constitute one and the same document, binding on all Parties notwithstanding that each of the Parties may have signed different counterparts. Signatures to this Agreement (including any Work Order) transmitted by fax, by electronic mail in “portable document format” (“.pdf’), or by any other electronic means intended to preserve the original graphic and pictorial appearance of the Agreement, shall have the same effect as physical delivery of the paper document bearing the original signature.

The remainder of this page is intentionally left blank.

Appendix A

Work Order No. ____

This Work Order dated as of _____, ____ (this "Work Order") between Adaptive Biotechnologies Corporation, on behalf of itself and its subsidiaries ("Client"), and ("Contractor") is an addendum to the Master Services Agreement between Client and Contractor dated _____, ____ (the "Agreement"). All of the terms and conditions of the Agreement, to the extent not expressly modified herein, are hereby incorporated into the terms and conditions of this Work Order as if set out in full herein.

Project Description:

The Services to be provided by Contractor under this Work Order shall be as set forth in the following attached document, which is incorporated herein by reference and made a part hereof: ***Insert name/title of attached proposal that describes the services and deliverables*** (the "Proposal"). ***If services include benefits conveyed to HCP participants, Contractor will provide to Adaptive Biotechnologies at the completion of the project: (i) what services/actions participants are being asked to provide; (ii) summary of agreed-upon compensation (e.g., estimated time spent by each participant x fair market value hourly rate); and (iii) a discussion of how HCP agreements will be handled (e.g., Client's legal department will contract directly with participants or Contractor will have all participants sign an agreement in the form of the attached Exhibit A). For blinded market research, Contractor will not be required to provide Client's legal department with a summary of participating HCPs or copies of their agreements. Such information will be required within a reasonable time of completing the Services for unblinded market research. As used herein, "unblinded market research" shall mean indirect payments or other transfers of value that qualify as an exclusion to reporting under the Federal Physician Payment Sunshine Act (42 CFR § 403.904 and the applicable state law, if any.***

Timing for Performance and Completion:

Contractor shall use its best efforts to complete all Services under this Work Order in accordance with the performance schedule set forth in the Proposal and to complete final project reconciliation by **Insert Completion Date.**

Compensation and Payment Schedule:

As full and complete consideration for Contractor's delivery of the Services in accordance with this Work Order and the Agreement, Contractor shall submit invoices to Client, and Client shall pay Contractor, as set forth in the Proposal and the Agreement. Unless otherwise agreed to by the Parties in a signed written amendment hereto, Client's liability to Contractor for Services hereunder shall not exceed $ **Insert Max dollar amount**.

IN WITNESS WHEREOF, the Parties have caused this Work Order to be executed by their duly authorized representatives as of the date first set forth in this Work Order.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement as of the Effective Date.

Adaptive Biotechnologies Corporation

By: /s/ Nancy L. Hill

Name: Nancy L. Hill

Title: SVP and GM, Research Products

ZS Associates, Inc.

By: /s/ Steve Love

Name: Steve Love

Title: Principal

Exihibit 10.6

FIRST AMENDMENT TO MASTER SERVICES AGREEMENT

THIS FIRST AMENDMENT TO MASTER SERVICES AGREEMENT (the "Amendment") is entered into as of this 24th day of April 2017 between ZS Associates, Inc. ("Contractor") and Adaptive Biotechnologies Corporation ("Client").

WHEREAS, Contractor and Client are parties to that certain Master Services Agreement effective as of August 5th, 2015 (the "Agreement") expiring on August 4th, 2017, and Contractor and Client desire to amend and extend the Agreement as follows.

NOW, THEREFORE, in consideration of the mutual promises as set forth below, Contractor and Client agree as follows:

1. Defined Terms. Any capitalized term used herein but not defined shall have the meaning ascribed to such term in the Agreement.

2. Amendment to Section 17 "Notices." The subsection titled "With a copy to" of Section 17 of the Agreement is hereby amended by deleting the current office address listed for Contractor and replacing it with the following:

   With a copy to:
   ZS Associates
   One Rotary Center
   1560 Sherman Avenue, Suite 800
   Evanston, IL 60201
   Fax: +1 847 492 3606
   Attention: Senior Legal Counsel

3. Amendment to Section 6 "Term." The first sentence of paragraph two of Section 6 of the Agreement is hereby deleted and replaced with the following:

   "This Agreement shall expire four (4) years after the Effective Date or, if later, concurrently with the latest termination effective date or expiration date of any applicable Work Order."

4. Conflict. In the event of a conflict between the terms of this Amendment and the Agreement, this Amendment shall control.

5. Continuation of Agreement. Except as specifically amended by this Amendment all other terms and conditions of the Agreement shall continue in full force and effect.

6. Counterparts. This Amendment may be signed in one or more counterparts, each of which shall be deemed an original, and all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, Contractor and Client have executed this Amendment as of the date set forth above.

ZS Associates, Inc.

By: /s/ Steve Love

Name: Steve Love

Title: Principal

Adaptive Biotechnologies Corporation

By: /s/ Susan Bobulsky

Name: Susan Bobulsky

Title: VP, clonoSEQ Commercialization, Marketing

1551 Eastlake Ave E, Ste 200
Seattle, WA 98102

206.659.0067
adaptivebiotech.com

_____ __, 2019

[Employee Name]
[Employee Address]
[Employee Address]

Re: Employment Agreement

Dear [Employee Name]:

This letter agreement (this "***Agreement***") confirms the terms of your employment with Adaptive Biotechnologies Corporation, a Washington corporation (the "***Company***").

1. Title and Cash Compensation

Your title is, and shall remain, [ ]. In such capacity, you will continue to report to [ ]. You shall devote your best efforts and full business time, skill and attention to the performance of your duties. You will also be expected to adhere to the general policies of the Company that may be in effect from time to time. As a condition of your employment, you will continue to be subject to the terms of the employee nondisclosure and assignment agreement executed by you on [ ] (the "***Nondisclosure and Assignment Agreement***").

As of the date hereof, your monthly base salary is $[ ] per month (or $[ ] on an annualized basis), payable in accordance with the Company's standard payroll schedule, less deductions and withholdings.

2. Bonus Compensation

As an employee, you may be eligible for certain cash incentive or bonus compensation in such amounts and based on such metrics as may be determined periodically by the Company's Board of Directors and/or Compensation Committee thereof.

3. Equity Awards

In connection with your service to the Company, you have been granted certain equity incentive awards as set forth on Exhibit A hereto (together with the notices of grant and stock option agreement related thereto, the "***Existing Awards***") under the Company's 2009 Equity Incentive Plan, as amended ("***2009 Plan***"), which shall continue to be governed in all respects by the terms of the 2009 Plan and your equity agreements thereunder. The Company may grant additional equity awards to you in the future from time to time under the Company's 2019 Equity Incentive Plan and/or other equity incentive plans or programs established by the Company (any such awards, "***Future Awards***", and together with the Existing Awards, the "***Awards***"), which will be subject to the terms of the applicable equity compensation plan or arrangement in effect at the time of grant. The Company's Board of Directors and/or Compensation Committee thereof will determine in its discretion whether you will be granted any such Future Awards and the terms and conditions of any such awards in accordance with the terms of any applicable equity plan. In addition to other applicable award documentation, the terms of the Existing Awards and Future Awards are and shall be subject to the terms and provisions of the change in control agreement attached hereto as Exhibit B (the "***CIC Agreement***").

You should be aware that you may incur federal and state income taxes as a result of your receipt or the vesting of any equity compensation awards and it is your responsibility to pay any such applicable taxes.

4. Other Benefits

As an employee, you will continue to be eligible for our standard employee benefits, subject to the terms and conditions of such plans and programs, except to the extent that this letter agreement provides you with more valuable benefits than the Company's standard policies.

5. Arbitration

In the event of any dispute or claim solely related to or arising out of the termination of your employment with the Company for any reason (including, but not limited to, any claims for breach of contract, wrongful termination, or age, sex, race, national origin, disability or other discrimination or harassment), you agree that all such disputes will be fully, finally and exclusively resolved by binding arbitration conducted by Judicial Dispute Resolution, LLC (or a similar entity if acceptable to the Company) in King County, Washington, pursuant to the Federal Arbitration Act. You and the Company hereby waive your respective rights to have any such disputes or claims tried by a judge or jury. This section will not apply to any claims for injunctive relief by the Company or you, any claims by the Company or you arising out of or related to proprietary and intellectual property rights, claims pursuant to the National Labor Relations Act, claims pursuant to the Washington State Law Against Discrimination, claims under federal discrimination laws, workers compensation claim(s), unemployment compensation benefits claim(s), or any other claims that, as a matter of law, the parties cannot agree to arbitrate.

6. Additional Terms

Your employment with the Company is for no specified period and constitutes "at will" employment. As a result, you are free to resign at any time, for any reason or for no reason. Similarly, the Company is free to conclude its employment relationship with you at any time, with or without cause or advance notice. You should note that the Company may modify job titles, compensation and benefits from time to time as it deems necessary or appropriate.

This Agreement, the Nondisclosure and Assignment Agreement, the Existing Awards and the CIC Agreement constitute the entire agreement between you and the Company regarding the terms and conditions of your employment and are the complete and exclusive statement of all of the terms and conditions of your employment with the Company, and supersede and replace any and all prior agreements or representations with regard to the subject matter hereof, whether written or oral, including that certain letter agreement by and between you and the Company dated on or about [ ], and that certain change of control agreement between you and the Company dated on or about [ ].

This Agreement is entered into without reliance on any promise or representation other than those expressly contained herein, and (except for changes reserved to the Company's discretion herein) cannot be modified or amended except in a writing signed by you and a duly authorized Company representative. Whenever possible, each provision of this Agreement will be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Agreement is held to be invalid, illegal or unenforceable in any respect under any applicable law or rule in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other provision or any other jurisdiction, but this Agreement will be reformed, construed and enforced as if such invalid, illegal or unenforceable provisions had never been contained herein. This Agreement and the terms of your employment with the Company shall be governed in all aspects by the laws of the State of Washington.

[*Signature page follows.*]

Please sign and date this Agreement on the spaces provided below to acknowledge your acceptance of the terms of this Agreement.

Sincerely,

_____
Chad Robins
Chief Executive Officer

I agree to and accept the terms and conditions set forth in this Agreement.

_____
[Employee Name]

Date: _____

Exhibit A

Existing Awards

Option Type	Date of Grant	Number of Shares	Exercise Price	Vesting Commencement Date	Expiration Date	Vesting Schedule

Exhibit B
Change in Control Agreement

If (a) your Service (as defined in the 2009 Plan) to the Company is terminated by the Company other than for death, disability or Cause (as defined in the 2009 Plan) within the three-month period prior to or the twelve-month period following a Change in Control (as defined in Section 2(g) of the 2009 Plan), or (b) the Acquiror (as defined in the 2009 Plan) in such Change in Control does not either (i) assume the Company's rights and obligations with respect to an Award or (ii) substitute such for such Award a substantially equivalent (A) award to purchase the Acquiror's (or its subsidiary's) stock or (B) cash award, then 100% of any unvested shares underlying your Existing Awards and any Future Awards shall immediately vest and, as applicable, become exercisable upon the later to occur of such termination and such Change in Control.

If any payment or benefit pursuant to this Agreement or otherwise that you would receive in connection with a Change in Control (a "***Transaction Payment***") would (i) constitute a "parachute payment" within the meaning of Section 280G of the Internal Revenue Code of 1986, as amended (the "***Code***"), and (ii) but for this sentence, be subject to the excise tax imposed by Section 4999 of the Code (the "***Excise Tax***"), then the Company shall cause the following: (1) payment in full of the entire amount of the Transaction Payments (a "***Full Payment***"), or (2) payment of only a part of the Transaction Payments so that you receive the largest payment possible without the imposition of the Excise Tax (a "***Reduced Payment***"), whichever amount results in your receipt, on an after-tax basis, of the greater amount of the Transaction Payment notwithstanding that all or some portion of the Transaction Payment may be subject to the Excise Tax. For purposes of determining whether to make a Full Payment or a Reduced Payment, the Company shall cause to be taken into account all applicable federal, state and local income and employment taxes and the Excise Tax (all computed at the highest applicable marginal rate, net of the maximum reduction in federal income taxes which could be obtained from a deduction of such state and local taxes). If a Reduced Payment is made, (x) the Transaction Payment shall be paid only to the extent permitted under the Reduced Payment alternative, and you shall have no rights to any additional payments and/or benefits constituting the Transaction Payment, and (y) reduction in payments and/or benefits shall occur in the following order: (1) reduction of cash payments (if any); (2) cancellation of accelerated vesting of equity awards other than stock options; (3) cancellation of accelerated vesting of stock options; and (4) reduction of other benefits (if any) paid to you; provided that in each case, the reduction of payments and benefits shall be implemented in a manner that does not violate Section 409A of the Code. In the event that acceleration from your equity awards is to be reduced, such acceleration of vesting shall be canceled in the reverse order of the date of grant. The Company shall appoint a nationally recognized independent registered public accounting firm or law firm to make the determinations required hereunder. The Company shall bear all expenses with respect to the determinations required to be made hereunder. The firm engaged to make the determinations hereunder shall provide its calculations, together with detailed supporting documentation, to the Company and you within fifteen (15) calendar days after the date on which your right to a Transaction Payment is triggered (if requested at that time by the Company or you) or such other time as reasonably requested by the Company or you. If firm determines that no Excise Tax is payable with respect to the Transaction Payments, either before or after the application of the Reduced Amount, it shall furnish the Company with an opinion reasonably acceptable to the Company that no Excise Tax will be imposed with respect to such Transaction Payments. Any good faith determinations of the firm made hereunder shall be final, binding and conclusive upon you.

Nothing in this Agreement changes the nature of your employment. Your employment with the Company continues to be "at will"; it is for no specified term, and may be terminated by you or the Company at any time, with or without cause or advance notice.

In consideration for the foregoing protections, by counter-signing the Agreement to which this is attached you reaffirm and agree that: (1) for a period ending one year after the Date of Termination for any reason (the "***Noncompetition Period***"), you will not directly or indirectly other than on behalf of the Company, without the prior written consent of the Company, engage (whether as an employee, agent, consultant, advisor, independent contractor, proprietor, partner, officer, director or otherwise), or have any ownership interest in (except for passive ownership of five percent (5%) or less of any entity whose securities have been registered under the Securities Act of 1933 or Section 12 of the Securities Exchange Act of 1934), or participate in the financing, operation, management or control of, that portion of any firm, partnership, corporation, entity or business that engages or participates in a competing business purpose; and (2) during the Noncompetition Period, you will not without the written consent of the Company, directly or indirectly through another entity, induce or attempt to induce any employee of the Company and its subsidiaries to leave the employ of the Company or a Company subsidiary, or in any way interfere with the relationship between the Company or a Company subsidiary and any employee thereof and will not induce or attempt to induce any customer, supplier, client, broker, licensee or other business relation of the Company or its subsidiaries to cease doing business, or to alter in any manner its business relationship, with the Company or its subsidiaries. By signing the Agreement, both parties signify their intent for the non-compete to be enforceable to the maximum extent allowable by law. This Agreement shall be governed in all aspects by the laws of the State of Washington.

1551 Eastlake Ave E, Ste 200
Seattle, WA 98102

206.659.0067
adaptivebiotech.com

_____ __, 2019

[Employee Name]
[Employee Address]
[Employee Address]

Re: Employment Agreement

Dear [Employee Name]:

This letter agreement (this "***Agreement***") confirms the terms of your employment with Adaptive Biotechnologies Corporation, a Washington corporation (the "***Company***").

1. Title and Cash Compensation

Your title is, and shall remain, [ ]. In such capacity, you will continue to report to [ ]. You shall devote your best efforts and full business time, skill and attention to the performance of your duties. You will also be expected to adhere to the general policies of the Company that may be in effect from time to time. As a condition of your employment, you will continue to be subject to the terms of the employee nondisclosure and assignment agreement executed by you on [ ] (the "***Nondisclosure and Assignment Agreement***").

As of the date hereof, your monthly base salary is $[ ] per month (or $[ ] on an annualized basis), payable in accordance with the Company's standard payroll schedule, less deductions and withholdings.

2. Bonus Compensation

As an employee, you may be eligible for certain cash incentive or bonus compensation in such amounts and based on such metrics as may be determined periodically by the Company's Board of Directors and/or Compensation Committee thereof; provided, however that for 2019, you will be entitled to a guaranteed bonus of [ ]% of your starting annual base salary, without proration for your start date.

3. Equity Awards

In connection with your service to the Company, you have been granted certain equity incentive awards as set forth on Exhibit A hereto (together with the notices of grant and stock option agreement related thereto, the "***Existing Awards***") under the Company's 2009 Equity Incentive Plan, as amended ("***2009 Plan***"), which shall continue to be governed in all respects by the terms of the 2009 Plan and your equity agreements thereunder. The Company may grant additional equity awards to you in the future from time to time under the Company's 2019 Equity Incentive Plan and/or other equity incentive plans or programs established by the Company (any such awards, "***Future Awards***", and together with the Existing Awards, the "***Awards***"), which will be subject to the terms of the applicable equity compensation plan or arrangement in effect at the time of grant. The Company's Board of Directors and/or Compensation Committee thereof will determine in its discretion whether you will be granted any such Future Awards and the terms and conditions of any such awards in accordance with the terms of any applicable equity plan. In addition to other applicable award documentation, the terms of the Existing Awards and Future Awards are and shall be subject to the terms and provisions of the change in control agreement attached hereto as Exhibit B (the "***CIC Agreement***").

You should be aware that you may incur federal and state income taxes as a result of your receipt or the vesting of any equity compensation awards and it is your responsibility to pay any such applicable taxes.

4. Other Benefits

As an employee, you will continue to be eligible for our standard employee benefits, subject to the terms and conditions of such plans and programs, except to the extent that this letter agreement provides you with more valuable benefits than the Company's standard policies.

5. Arbitration

In the event of any dispute or claim solely related to or arising out of the termination of your employment with the Company for any reason (including, but not limited to, any claims for breach of contract, wrongful termination, or age, sex, race, national origin, disability or other discrimination or harassment), you agree that all such disputes will be fully, finally and exclusively resolved by binding arbitration conducted by Judicial Dispute Resolution, LLC (or a similar entity if acceptable to the Company) in King County, Washington, pursuant to the Federal Arbitration Act. You and the Company hereby waive your respective rights to have any such disputes or claims tried by a judge or jury. This section will not apply to any claims for injunctive relief by the Company or you, any claims by the Company or you arising out of or related to proprietary and intellectual property rights, claims pursuant to the National Labor Relations Act, claims pursuant to the Washington State Law Against Discrimination, claims under federal discrimination laws, workers compensation claim(s), unemployment compensation benefits claim(s), or any other claims that, as a matter of law, the parties cannot agree to arbitrate.

6. Additional Terms

Your employment with the Company is for no specified period and constitutes "at will" employment. As a result, you are free to resign at any time, for any reason or for no reason. Similarly, the Company is free to conclude its employment relationship with you at any time, with or without cause or advance notice. You should note that the Company may modify job titles, compensation and benefits from time to time as it deems necessary or appropriate.

This Agreement, the Nondisclosure and Assignment Agreement, the Existing Awards and the CIC Agreement constitute the entire agreement between you and the Company regarding the terms and conditions of your employment and are the complete and exclusive statement of all of the terms and conditions of your employment with the Company, and supersede and replace any and all prior agreements or representations with regard to the subject matter hereof, whether written or oral, including that certain letter agreement by and between you and the Company dated on or about [ ], and that certain change of control agreement between you and the Company dated on or about [ ].

This Agreement is entered into without reliance on any promise or representation other than those expressly contained herein, and (except for changes reserved to the Company's discretion herein) cannot be modified or amended except in a writing signed by you and a duly authorized Company representative. Whenever possible, each provision of this Agreement will be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Agreement is held to be invalid, illegal or unenforceable in any respect under any applicable law or rule in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other provision or any other jurisdiction, but this Agreement will be reformed, construed and enforced as if such invalid, illegal or unenforceable provisions had never been contained herein. This Agreement and the terms of your employment with the Company shall be governed in all aspects by the laws of the State of Washington.

[*Signature page follows.*]

Please sign and date this Agreement on the spaces provided below to acknowledge your acceptance of the terms of this Agreement.

Sincerely,

_____
Chad Robins
Chief Executive Officer

I agree to and accept the terms and conditions set forth in this Agreement.

_____
[Employee Name]

Date: _____

Exhibit A

Existing Awards

Option Type	Date of Grant	Number of Shares	Exercise Price	Vesting Commencement Date	Expiration Date	Vesting Schedule

Exhibit B
Change in Control Agreement

If (a) your Service (as defined in the 2009 Plan) to the Company is terminated by the Company other than for death, disability or Cause (as defined in the 2009 Plan) within the three-month period prior to or the twelve-month period following a Change in Control (as defined in Section 2(g) of the 2009 Plan), or (b) the Acquiror (as defined in the 2009 Plan) in such Change in Control does not either (i) assume the Company's rights and obligations with respect to an Award or (ii) substitute such for such Award a substantially equivalent (A) award to purchase the Acquiror's (or its subsidiary's) stock or (B) cash award, then 100% of any unvested shares underlying your Existing Awards and any Future Awards shall immediately vest and, as applicable, become exercisable upon the later to occur of such termination and such Change in Control.

If any payment or benefit pursuant to this Agreement or otherwise that you would receive in connection with a Change in Control (a "***Transaction Payment***") would (i) constitute a "parachute payment" within the meaning of Section 280G of the Internal Revenue Code of 1986, as amended (the "***Code***"), and (ii) but for this sentence, be subject to the excise tax imposed by Section 4999 of the Code (the "***Excise Tax***"), then the Company shall cause the following: (1) payment in full of the entire amount of the Transaction Payments (a "***Full Payment***"), or (2) payment of only a part of the Transaction Payments so that you receive the largest payment possible without the imposition of the Excise Tax (a "***Reduced Payment***"), whichever amount results in your receipt, on an after-tax basis, of the greater amount of the Transaction Payment notwithstanding that all or some portion of the Transaction Payment may be subject to the Excise Tax. For purposes of determining whether to make a Full Payment or a Reduced Payment, the Company shall cause to be taken into account all applicable federal, state and local income and employment taxes and the Excise Tax (all computed at the highest applicable marginal rate, net of the maximum reduction in federal income taxes which could be obtained from a deduction of such state and local taxes). If a Reduced Payment is made, (x) the Transaction Payment shall be paid only to the extent permitted under the Reduced Payment alternative, and you shall have no rights to any additional payments and/or benefits constituting the Transaction Payment, and (y) reduction in payments and/or benefits shall occur in the following order: (1) reduction of cash payments (if any); (2) cancellation of accelerated vesting of equity awards other than stock options; (3) cancellation of accelerated vesting of stock options; and (4) reduction of other benefits (if any) paid to you; provided that in each case, the reduction of payments and benefits shall be implemented in a manner that does not violate Section 409A of the Code. In the event that acceleration from your equity awards is to be reduced, such acceleration of vesting shall be canceled in the reverse order of the date of grant. The Company shall appoint a nationally recognized independent registered public accounting firm or law firm to make the determinations required hereunder. The Company shall bear all expenses with respect to the determinations required to be made hereunder. The firm engaged to make the determinations hereunder shall provide its calculations, together with detailed supporting documentation, to the Company and you within fifteen (15) calendar days after the date on which your right to a Transaction Payment is triggered (if requested at that time by the Company or you) or such other time as reasonably requested by the Company or you. If firm determines that no Excise Tax is payable with respect to the Transaction Payments, either before or after the application of the Reduced Amount, it shall furnish the Company with an opinion reasonably acceptable to the Company that no Excise Tax will be imposed with respect to such Transaction Payments. Any good faith determinations of the firm made hereunder shall be final, binding and conclusive upon you.

Nothing in this Agreement changes the nature of your employment. Your employment with the Company continues to be "at will"; it is for no specified term, and may be terminated by you or the Company at any time, with or without cause or advance notice.

In consideration for the foregoing protections, by counter-signing the Agreement to which this is attached you reaffirm and agree that: (1) for a period ending one year after the Date of Termination for any reason (the "***Noncompetition Period***"), you will not directly or indirectly other than on behalf of the Company, without the prior written consent of the Company, engage (whether as an employee, agent, consultant, advisor, independent contractor, proprietor, partner, officer, director or otherwise), or have any ownership interest in (except for passive ownership of five percent (5%) or less of any entity whose securities have been registered under the Securities Act of 1933 or Section 12 of the Securities Exchange Act of 1934), or participate in the financing, operation, management or control of, that portion of any firm, partnership, corporation, entity or business that engages or participates in a competing business purpose; and (2) during the Noncompetition Period, you will not without the written consent of the Company, directly or indirectly through another entity, induce or attempt to induce any employee of the Company and its subsidiaries to leave the employ of the Company or a Company subsidiary, or in any way interfere with the relationship between the Company or a Company subsidiary and any employee thereof and will not induce or attempt to induce any customer, supplier, client, broker, licensee or other business relation of the Company or its subsidiaries to cease doing business, or to alter in any manner its business relationship, with the Company or its subsidiaries. By signing the Agreement, both parties signify their intent for the non-compete to be enforceable to the maximum extent allowable by law. This Agreement shall be governed in all aspects by the laws of the State of Washington.

1551 Eastlake Ave E, Ste 200
Seattle, WA 98102

206.659.0067
adaptivebiotech.com

[Date]

[Non-Employee Director Name]
[Non-Employee Director Address]
[Non-Employee Director Address]

Re: Restated Non-Employee Director Change in Control Agreement

Dear [Non-Employee Director Name]:

On behalf of Adaptive Biotechnologies Corporation (the "***Company***"), I am pleased to offer you the following protections in case of a Change in Control (as defined in the Company's 2009 Equity Incentive Plan, as amended, the "***Plan***"). In the event of a Change in Control, and provided you are then providing Service (as defined in the Plan), all stock options or other equity granted to you under the Plan, the Company's 2019 Equity Incentive Plan and/or other equity incentive plans or programs established by the Company, which are unvested as of the date of such Change in Control shall become immediately vested in full immediately prior to the consummation of the Change in Control.

If any payment or benefit pursuant to this letter agreement or otherwise that you would receive in connection with a Change in Control (a "***Transaction Payment***") would (i) constitute a "parachute payment" within the meaning of Section 280G of the Internal Revenue Code of 1986, as amended (the "***Code***"), and (ii) but for this sentence, be subject to the excise tax imposed by Section 4999 of the Code (the "***Excise Tax***"), then the Company shall cause the following: (1) payment in full of the entire amount of the Transaction Payments (a "***Full Payment***"), or (2) payment of only a part of the Transaction Payments so that you receive the largest payment possible without the imposition of the Excise Tax (a "***Reduced Payment***"), whichever amount results in your receipt, on an after-tax basis, of the greater amount of the Transaction Payment notwithstanding that all or some portion of the Transaction Payment may be subject to the Excise Tax. For purposes of determining whether to make a Full Payment or a Reduced Payment, the Company shall cause to be taken into account all applicable federal, state and local income and employment taxes and the Excise Tax (all computed at the highest applicable marginal rate, net of the maximum reduction in federal income taxes which could be obtained from a deduction of such state and local taxes). If a Reduced Payment is made, (x) the Transaction Payment shall be paid only to the extent permitted under the Reduced Payment alternative, and you shall have no rights to any additional payments and/or benefits constituting the Transaction Payment, and (y) reduction in payments and/or benefits shall occur in the following order: (1) reduction of cash payments (if any); (2) cancellation of accelerated vesting of equity awards other than stock options; (3) cancellation of accelerated vesting of stock options; and (4) reduction of other benefits (if any) paid to you; provided that in each case, the reduction of payments and benefits shall be implemented in a manner that does not violate Section 409A of the Code. In the event that acceleration from your equity awards is to be reduced, such acceleration of vesting shall be canceled in the reverse order of the date of grant. The Company shall appoint a nationally recognized independent registered public accounting firm or law firm to make the determinations required hereunder. The Company shall bear all expenses with respect to the determinations required to be made hereunder. The firm engaged to make the determinations hereunder shall provide its calculations, together with detailed supporting documentation, to the Company and you within fifteen (15) calendar days after the date on which your right to a Transaction Payment is triggered (if requested at that time by the Company or you) or such other time as reasonably requested by the Company or you. If firm determines that no Excise Tax is payable with respect to the Transaction Payments, either before or after the application of the Reduced Amount, it shall furnish the Company with an opinion reasonably acceptable to the Company that no Excise Tax will be imposed with respect to such Transaction Payments. Any good faith determinations of the firm made hereunder shall be final, binding and conclusive upon you.

In consideration for the foregoing protections, by counter-signing below you agree that for a period ending two (2) years after the date of your termination of service on the Company's board of directors, you will not without the written consent of the Company, directly or indirectly through another entity, induce or attempt to induce any employee of the Company and its subsidiaries to leave the employ of the Company or a Company subsidiary, or in any way interfere with the relationship between the Company or a Company subsidiary and any employee thereof and will not induce or attempt to induce any customer, supplier, client, broker, licensee or other business relation of the Company or its subsidiaries to cease doing business, or to alter in any manner its business relationship, with the Company or its subsidiaries. By signing this agreement, both parties signify their intent for the non-solicitation covenant to be enforceable to the maximum extent allowable by law.

This letter agreement supersedes, and amends and restates in its entirety, that certain Non-Employee Director change of control agreement by and between you and the Company dated as of [ ].

Sincerely,

ADAPTIVE BIOTECHNOLOGIES CORPORATION

_____

Chad Robins
Chief Executive Officer

I agree to and accept the terms and conditions set forth in this letter agreement.

_____

[Non-Employee Director Name]

Date: _____

1551 Eastlake Ave E, Ste 200
Seattle, WA 98102

206.659.0067
adaptivebiotech.com

May 1, 2019

Chad Cohen
[address]

Re: Executive Severance Agreement

Dear Chad:

This letter agreement (this "***Agreement***") confirms the terms of your severance rights in connection with your employment with Adaptive Biotechnologies Corporation, a Washington corporation (the "***Company***"), and supplements that certain letter agreement regarding your employment with the Company dated on or about May 1, 2019 (the "***Employment Agreement***"). Capitalized terms used but not otherwise defined herein shall have the meanings ascribed to them in the Employment Agreement.

1. Severance

As further detailed in your Employment Agreement, your employment with the Company is "at will"; it is for no specified term, and may be terminated by you or the Company at any time, with or without cause or advance notice.

If (i) you are terminated for a reason other than for Cause (as defined below), death, or your disability or (ii) you resign for Good Reason (as defined below), then, if you execute a full release of claims in the form of the release attached as Exhibit A (the "***Release***") and such Release becomes effective and irrevocable within sixty (60) days of the effective date of such termination, the Company will pay you a lump sum payment equivalent to twelve (12) months of your base salary (at the base salary rate then in effect as of your termination date or, if your termination is due to a Good Reason resignation, the greater of the base salary rate then in effect on your termination date or the date immediately prior to the event constituting Good Reason) (the "***Severance Payment***"), payable on the first payroll period after the sixty (60) day anniversary of your termination date, subject to your continued compliance with the obligations set forth in the Release and the Company's standard form of nondisclosure and assignment agreement.

For purposes of this Agreement, "***Cause***" is defined as: (a) theft or embezzlement by you with respect to the Company or its subsidiaries; (b) intentional failure to perform your duties to the Company without the same being corrected within thirty (30) days after being given written notice thereof by the Company; (c) the commission by you of any felony or any crime involving moral turpitude (but excluding driving offenses); (d) willful or prolonged absence from work by you (other than by reason of disability due to physical or mental illness) or failure, gross neglect or refusal by the you to perform your duties and responsibilities without the same being corrected within thirty (30) days after being given written notice thereof by the Company; (e) continued and habitual use of alcohol by you to an extent which materially impairs your performance of your duties without the same being corrected within fifteen (15) days after being given written notice thereof by the Company; or (f) your use of illegal drugs without the same being corrected within thirty (30) days after being given written notice thereof.

For purposes of this Agreement, "***Good Reason***" means, without your written consent, (a) the material diminution or variation of your title or any of your material duties or responsibilities or the engagement by Company of unlawful employment practices with respect to you, (b) a reduction in the your base salary, (c) a breach by the Company of this Agreement or any other agreement between you and the Company, or (d) the occurrence of a Change in Control; *provided*, *however*, that for "Good Reason" to be established, you must provide written notice to the Company's general counsel within thirty (30) days immediately following such events described in (a) through (d) above, the Company must fail to remedy such event within thirty (30) days after receipt of such notice, and your resignation must be effective not later than ninety (90) days after the expiration of such cure period.

To the extent that payments and benefits in this Agreement are subject to Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***"), this Agreement is intended to comply with and will be interpreted in a manner intended to comply with Section 409A of the Code. To the extent that any provision in this offer is ambiguous as to its compliance with Section 409A of the Code, the provision shall be read in such a manner so that no payments due under this Agreement shall be subject to an "additional tax" as defined in Section 409(a)(1)(B) of the Code. Notwithstanding anything herein to the contrary, if at the time of your separation from service from the Company you designated as a "specified employee" as defined in Section 409A of the Code (and any related regulations or other pronouncements thereunder) and the deferral of the commencement of any payments or benefits otherwise payable hereunder as a result of such separation from service is necessary in order to prevent any accelerated or additional tax under Section 409A of the Code, then the Company will defer the commencement of the payment of any such payments or benefits hereunder (without any reduction in such payments or benefits ultimately paid or provided to you) until the expiration of the six-month period measured from the date of your separation from service with the Company (or the earliest date as is permitted under Section 409A of the Code). On the first day of the seventh month following the date of your separation from service, or if earlier, the date of your death, all payments delayed pursuant to this paragraph (whether they would have otherwise been paid or reimbursed to you in a single sum or in installments) shall be paid or reimbursed to you in a single sum and any remaining payments and benefits due to you shall be paid or provided in accordance with the normal dates specified for them in this Agreement or in another agreement between you and the Company. In addition, if any other payments of money or other benefits due to you hereunder could cause the application of an accelerated or additional tax under Section 409A of the Code as determined jointly by you and the Company, such payments or other benefits shall be deferred if deferral will make such payment or other benefits compliant under Section 409A of the Code, or otherwise such payment or other benefits shall be restructured, to the extent possible, in a manner, determined by the Company, that does not cause such an accelerated or additional tax. To the extent any reimbursements or in-kind benefits due to you under this Agreement or otherwise constitute "deferred compensation" under Section 409A of the Code as determined jointly by you and the Company, any such reimbursements or in-kind benefits shall be paid to you in a manner consistent with Treas. Reg. Section 1.409A-3(i)(1)(iv). Each payment made under this Agreement or otherwise shall be designated as a "separate payment" within the meaning of Section 409A of the Code. References herein to a termination of your employment shall be deemed to refer to the date upon which you have experienced a "separation from service" within the meaning of Code Section 409A. The Company shall consult with you in good faith regarding the implementation of the provisions of this paragraph. Additionally, in the event that the acceleration of vesting of equity awards contemplated under this Agreement is deemed a "parachute payment" to you under the Code, the Company shall pay to you an additional cash bonus at the time of the consummation of such Change in Control (or later termination of your employment, if applicable) so as to fully compensate you for the additional tax liability resulting from such acceleration of vesting, including additional tax liability with respect to payments made pursuant to this sentence. The preceding provisions, however, shall not be construed as a guarantee by the Company of any particular tax effect to you under this Agreement.

2. Arbitration

In the event of any dispute or claim solely related to or arising out of the termination of your employment with the Company for any reason (including, but not limited to, any claims for breach of contract, wrongful termination, or age, sex, race, national origin, disability or other discrimination or harassment), you agree that all such disputes will be fully, finally and exclusively resolved by binding arbitration conducted by Judicial Dispute Resolution, LLC (or a similar entity if acceptable to the Company) in King County, Washington, pursuant to the Federal Arbitration Act. You and the Company hereby waive your respective rights to have any such disputes or claims tried by a judge or jury. This section will not apply to any claims for injunctive relief by the Company or you, any claims by the Company or you arising out of or related to proprietary and intellectual property rights, claims pursuant to the National Labor Relations Act, claims pursuant to the Washington State Law Against Discrimination, claims under federal discrimination laws, workers compensation claim(s), unemployment compensation benefits claim(s), or any other claims that, as a matter of law, the parties cannot agree to arbitrate.

3. Additional Terms

This Agreement, the Employment Agreement, the Nondisclosure and Assignment Agreement, the Existing Awards and the CIC Agreement (as defined below) constitute the entire agreement between you and the Company regarding the terms and conditions of your employment are the complete and exclusive statement of all of the terms and conditions of your employment with the Company, and supersede and replace any and all prior agreements or representations with regard to the subject matter hereof, whether written or oral, including that certain employment letter agreement by and between you and the Company dated on or about June 26, 2015, as amended September 23, 2015, and that certain change of control agreement between you and the Company dated on or about August 7, 2017. However, this Agreement shall not supersede the change in control agreement between you and the Company dated on or about May 1, 2019 ("***CIC Agreement***").

This Agreement is entered into without reliance on any promise or representation other than those expressly contained herein, and (except for changes reserved to the Company's discretion herein) cannot be modified or amended except in a writing signed by you and a duly authorized Company representative. Whenever possible, each provision of this Agreement will be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Agreement is held to be invalid, illegal or unenforceable in any respect under any applicable law or rule in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other provision or any other jurisdiction, but this Agreement will be reformed, construed and enforced as if such invalid, illegal or unenforceable provisions had never been contained herein. This Agreement and the terms of your employment with the Company shall be governed in all aspects by the laws of the State of Washington.

[*Signature page follows*.]

Please sign and date this Agreement on the spaces provided below to acknowledge your acceptance of the terms of this Agreement.

Sincerely,

/s/ Chad Robins
Chad Robins
Chief Executive Officer

I agree to and accept the terms and conditions set forth in this Agreement.

/s/ Chad Cohen
Chad Cohen

Date: May 1, 2019

Exhibit A
Release

[*Separately attached.*]

1551 Eastlake Ave E, Ste 200
Seattle, WA 98102

206.659.0067
adaptivebiotech.com

April 22, 2019

Lance Baldo, MD
[address]

Re: Executive Severance Agreement

Dear Lance:

This letter agreement (this "***Agreement***") confirms the terms of your severance rights in connection with your employment with Adaptive Biotechnologies Corporation, a Washington corporation (the "***Company***"), and supplements that certain letter agreement regarding your employment with the Company dated on or about the date hereof (the "***Employment Offer***"). Capitalized terms used but not otherwise defined herein shall have the meanings ascribed to them in the Employment Offer.

1. Severance

As further detailed in your Employment Offer, your employment with the Company is "at will"; it is for no specified term, and may be terminated by you or the Company at any time, with or without cause or advance notice.

If (i) you are terminated by the Company for a reason other than for Cause (as defined below), death, or your disability or (ii) you resign for Good Reason (as defined below) (either of (i) or (ii), an "***Involuntary Termination***"), then, if you execute a full release of claims in the form of the release attached as Exhibit A (the "***Release***") and such Release becomes effective and irrevocable within sixty (60) days of the effective date of such termination, the Company will pay you a lump sum payment equivalent to (a) if such Involuntary Termination occurs after your Start Date but before the twelve (12) month anniversary of your Start Date, twelve (12) months of your base salary, (b) if such Involuntary Termination occurs on or after the twelve (12) month anniversary of your Start Date but before the twenty-four (24) month anniversary of your Start Date, six (6) months of your base salary, and (c) if such Involuntary Termination occurs on or after the twenty-four (24) month anniversary of your Start Date, three (3) months of your base salary (in each case, with such payment to be calculated based on the base salary rate then in effect as of your termination date or, if your termination is due to a Good Reason resignation, the greater of the base salary rate then in effect on your termination date or the date immediately prior to the event constituting Good Reason) (the "***Severance Payment***"), payable on the first payroll period after the sixty (60)-day anniversary of your termination date, subject to your continued compliance with the obligations set forth in the Release and the Employee Confidentiality Agreement.

Furthermore, in the event of an Involuntary Termination other than within the three-month period prior to or the twelve-month period following a Change in Control (as defined in the Company's 2009 Equity Incentive Plan, as amended), then 25% of any unvested shares under that certain stock option grant contemplated in your Employment Offer shall immediately vest and become exercisable as of the date of such Involuntary Termination and the post termination exercise period for all vested shares under such option grant (including those accelerated pursuant hereto) shall be automatically extended to two years from the date of such Involuntary Termination.

For purposes of this Agreement, "***Cause***" shall have the following meaning:

"***Cause***" means: (i) your theft, dishonesty, willful misconduct, breach of fiduciary duty for personal profit, or falsification of any Company documents or records; (ii) your material failure to abide by the Company's code of conduct or other policies (including, without limitation, policies relating to confidentiality

and reasonable workplace conduct), provided that you are given written notice of the alleged failure and a 30 day period to cure provided cure is possible; (iii) your intentional and unauthorized use, misappropriation, destruction or diversion of any tangible or intangible asset or corporate opportunity of the Company (including, without limitation, your improper use or disclosure of the Company's confidential or proprietary information); (iv) any intentional act by you which has a material detrimental effect on the Company's reputation or business; (v) your repeated failure or inability to perform any reasonable assigned material duties after written notice from the Company of, and a reasonable opportunity to cure, such failure or inability; (vi) any material breach by you of any employment, service, non-disclosure, non-competition, non-solicitation or other similar agreement between you and the Company, provided you receive written notice of the alleged breach and which breach is not cured pursuant to the terms of such agreement; or (vii) your conviction (including any plea of guilty or nolo contendere) of any criminal act involving fraud, dishonesty, misappropriation or moral turpitude, or which impairs your ability to perform your duties with the Company.

For purposes of this Agreement "***Good Reason***" means, without your written consent, (a) the material diminution of your title or of any of your material duties or responsibilities, (b) a reduction in your base salary, other than in connection with a simultaneous and proportionate reduction in the base salary of all other executive officers of the Company that does not exceed 10% of each such executive officer's base salary and (c) you are required to move more than 35 miles from your current residence, except, however if the San Francisco office is closed and you are required to move to Seattle; provided, however, that for "Good Reason" to be established, you must provide written notice to the Company's general counsel within thirty (30) days immediately following the relevant event described in (a) or (b) above, the Company must fail to remedy such event within thirty (30) days after receipt of such notice, and your resignation must be effective no later than fourteen (14) days after the expiration of such cure period.

In the event there is any conflict between the terms defined in this Severance Agreement and any other documents you receive from the Company (including the Company's Equity Incentive Plan, Stock Agreement or Offer Letter), the defined terms in this Agreement control.

To the extent that payments and benefits in this Agreement are subject to Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***"), this Agreement is intended to comply with and will be interpreted in a manner intended to comply with Section 409A of the Code. To the extent that any provision in this offer is ambiguous as to its compliance with Section 409A of the Code, the provision shall be read in such a manner so that no payments due under this Agreement shall be subject to an "additional tax" as defined in Section 409(a)(1)(B) of the Code. Notwithstanding anything herein to the contrary, if at the time of your separation from service from the Company you designated as a "specified employee" as defined in Section 409A of the Code (and any related regulations or other pronouncements thereunder) and the deferral of the commencement of any payments or benefits otherwise payable hereunder as a result of such separation from service is necessary in order to prevent any accelerated or additional tax under Section 409A of the Code, then the Company will defer the commencement of the payment of any such payments or benefits hereunder (without any reduction in such payments or benefits ultimately paid or provided to you) until the expiration of the six-month period measured from the date of your separation from service with the Company (or the earliest date as is permitted under Section 409A of the Code). On the first day of the seventh month following the date of your separation from service, or if earlier, the date of your death, all payments delayed pursuant to this paragraph (whether they would have otherwise been paid or reimbursed to you in a single sum or in installments) shall be paid or reimbursed to you in a single sum and any remaining payments and benefits due to you shall be paid or provided in accordance with the normal dates specified for them in this Agreement or in another agreement between you and the Company. In addition, if any other payments of money or other benefits due to you hereunder could cause the application of an accelerated or additional tax under Section 409A of the Code as determined jointly by you and the Company, such payments or other

benefits shall be deferred if deferral will make such payment or other benefits compliant under Section 409A of the Code, or otherwise such payment or other benefits shall be restructured, to the extent possible, in a manner, determined by the Company, that does not cause such an accelerated or additional tax. To the extent any reimbursements or in-kind benefits due to you under this Agreement or otherwise constitute "deferred compensation" under Section 409A of the Code as determined jointly by you and the Company, any such reimbursements or in-kind benefits shall be paid to you in a manner consistent with Treas. Reg. Section 1.409A-3(i)(1)(iv). Each payment made under this Agreement or otherwise shall be designated as a "separate payment" within the meaning of Section 409A of the Code. References herein to a termination of your employment shall be deemed to refer to the date upon which you have experienced a "separation from service" within the meaning of Code Section 409A. The Company shall consult with you in good faith regarding the implementation of the provisions of this paragraph. The preceding provisions, however, shall not be construed as a guarantee by the Company of any particular tax effect to you under this Agreement.

2. Arbitration

In the event of any dispute or claim solely related to or arising out of the termination of your employment with the Company for any reason (including, but not limited to, any claims for breach of contract, wrongful termination, or age, sex, race, national origin, disability or other discrimination or harassment), you agree that all such disputes will be fully, finally and exclusively resolved by binding arbitration conducted by Judicial Dispute Resolution, LLC (or a similar entity if acceptable to the Company) in San Francisco County, pursuant to the Federal Arbitration Act. You and the Company hereby waive your respective rights to have any such disputes or claims tried by a judge or jury. This section will not apply to any claims for injunctive relief by the Company or you, any claims by the Company or you arising out of or related to proprietary and intellectual property rights, claims pursuant to the National Labor Relations Act, claims under the California Private Attorney General Act, claims under federal discrimination laws, workers compensation claim(s), unemployment compensation benefits claim(s), or any other claims that, as a matter of law, the parties cannot agree to arbitrate.

3. Additional Terms

This Agreement, the Employment Offer, the Employee Confidentiality Agreement, the CoC Agreement and the stock option agreements referred to in your Employment Offer constitute the entire agreement between you and the Company regarding the terms and conditions of your employment, are the complete and exclusive statement of all of the terms and conditions of your employment with the Company, and supersede and replace any and all prior agreements or representations with regard to the subject matter hereof, whether written or oral,.

This Agreement is entered into without reliance on any promise or representation other than those expressly contained herein, and (except for changes reserved to the Company's discretion herein) cannot be modified or amended except in a writing signed by you and a duly authorized Company representative. Whenever possible, each provision of this Agreement will be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Agreement is held to be invalid, illegal or unenforceable in any respect under any applicable law or rule in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other provision or any other jurisdiction, but this Agreement will be reformed, construed and enforced as if such invalid, illegal or unenforceable provisions had never been contained herein. This Agreement and the terms of your employment with the Company shall be governed in all aspects by the laws of the State of California.

[*Signature page follows.*]

Please sign and date this Agreement on the spaces provided below to acknowledge your acceptance of the terms of this Agreement.

Sincerely,

/s/ Chad Robins
Chad Robins
Chief Executive Officer

I agree to and accept the terms and conditions set forth in this Agreement.

/s/ Lance Baldo, MD
Lance Baldo, MD

Date: April 22, 2019

Exhibit A
Release

[*Separately attached.*]

1551 Eastlake Ave E, Ste 200
Seattle, WA 98102

206.659.0067
adaptivebiotech.com

May 1, 2019

Charles Sang
[address]

Re: Executive Severance Agreement

Dear Charles:

This letter agreement (this "***Agreement***") confirms the terms of your severance rights in connection with your employment with Adaptive Biotechnologies Corporation, a Washington corporation (the "***Company***"), and supplements that certain letter agreement regarding your employment with the Company dated on or about May 1, 2019 (the "***Employment Agreement***"). Capitalized terms used but not otherwise defined herein shall have the meanings ascribed to them in the Employment Agreement.

1. Severance

As further detailed in your Employment Agreement, your employment with the Company is "at will"; it is for no specified term, and may be terminated by you or the Company at any time, with or without cause or advance notice.

If (i) you are terminated by the Company for a reason other than for Cause (as defined below), death, or your disability or (ii) you resign for Good Reason (as defined below), then, if you execute a full release of claims in the form of the release attached as Exhibit A (the "***Release***") and such Release becomes effective and irrevocable within sixty (60) days of the effective date of such termination, the Company will pay you a lump sum payment equivalent to three (3) months of your base salary (at the base salary rate then in effect as of your termination date or, if your termination is due to a Good Reason resignation, the greater of the base salary rate then in effect on your termination date or the date immediately prior to the event constituting Good Reason) (the "***Severance Payment***"), payable on the first payroll period after the sixty (60)-day anniversary of your termination date, subject to your continued compliance with the obligations set forth in the Release and the Company's standard form of nondisclosure and assignment agreement.

For purposes of this Agreement, "***Cause***" is defined as: (a) theft or embezzlement by you with respect to the Company or its affiliates; (b) willful misconduct or gross negligence in performance of your duties, including your refusal to comply in any material respect with the directives of the chief executive officer or the Board so long as such directives are not inconsistent with any legal obligation or requirement; (c) dishonest or fraudulent conduct, a deliberate attempt to do an injury to the Company, or other intentional conduct that materially discredits the Company or is materially detrimental to the financial condition or reputation of the Company, including the commission by you of any felony or any crime involving moral turpitude; (d) willful or prolonged absence from work by you (other than by reason of disability due to physical or mental illness) or failure, gross neglect or refusal by the you to perform your duties and responsibilities; (e) continued and habitual use of alcohol by you to an extent which materially impairs your performance of your duties without the same being corrected within fifteen (15) days after being give written notice thereof by the Company; (f) your use of illegal drugs without the same being corrected within thirty (30) days after being given written notice thereof; or (g) your material breach of any element of any agreement between you and the Company, including, without limitation, theft or other misappropriation of the Company's proprietary information, which breach (if determined in good faith by the Board to be curable) is not remedied within ten (10) working days after written notice.

For purposes of this Agreement "***Good Reason***" means, without your written consent, (a) a reduction in your base salary other than in connection with simultaneous reductions in all other senior executives at the vice president

level or above of equal or greater amount in percentage terms, or (b) the relocation of your principal work facility to a location that is more than thirty (30) miles from Seattle, it being understood that significant travel to the Company's San Francisco offices and occasional travel to other cities for conferences and meetings will be expected; provided, however, that for "Good Reason" to be established, you must provide written notice to the Company's general counsel within thirty (30) days immediately following the relevant event described in (a) or (b) above, the Company must fail to remedy such event within thirty (30) days after receipt of such notice, and your resignation must be effective no later than fourteen (14) days after the expiration of such cure period.

To the extent that payments and benefits in this Agreement are subject to Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***"), this Agreement is intended to comply with and will be interpreted in a manner intended to comply with Section 409A of the Code. To the extent that any provision in this offer is ambiguous as to its compliance with Section 409A of the Code, the provision shall be read in such a manner so that no payments due under this Agreement shall be subject to an "additional tax" as defined in Section 409(a)(1)(B) of the Code. Notwithstanding anything herein to the contrary, if at the time of your separation from service from the Company you designated as a "specified employee" as defined in Section 409A of the Code (and any related regulations or other pronouncements thereunder) and the deferral of the commencement of any payments or benefits otherwise payable hereunder as a result of such separation from service is necessary in order to prevent any accelerated or additional tax under Section 409A of the Code, then the Company will defer the commencement of the payment of any such payments or benefits hereunder (without any reduction in such payments or benefits ultimately paid or provided to you) until the expiration of the six-month period measured from the date of your separation from service with the Company (or the earliest date as is permitted under Section 409A of the Code). On the first day of the seventh month following the date of your separation from service, or if earlier, the date of your death, all payments delayed pursuant to this paragraph (whether they would have otherwise been paid or reimbursed to you in a single sum or in installments) shall be paid or reimbursed to you in a single sum and any remaining payments and benefits due to you shall be paid or provided in accordance with the normal dates specified for them in this Agreement or in another agreement between you and the Company. In addition, if any other payments of money or other benefits due to you hereunder could cause the application of an accelerated or additional tax under Section 409A of the Code as determined jointly by you and the Company, such payments or other benefits shall be deferred if deferral will make such payment or other benefits compliant under Section 409A of the Code, or otherwise such payment or other benefits shall be restructured, to the extent possible, in a manner, determined by the Company, that does not cause such an accelerated or additional tax. To the extent any reimbursements or in-kind benefits due to you under this Agreement or otherwise constitute "deferred compensation" under Section 409A of the Code as determined jointly by you and the Company, any such reimbursements or in-kind benefits shall be paid to you in a manner consistent with Treas. Reg. Section 1.409A-3(i)(1)(iv). Each payment made under this Agreement or otherwise shall be designated as a "separate payment" within the meaning of Section 409A of the Code. References herein to a termination of your employment shall be deemed to refer to the date upon which you have experienced a "separation from service" within the meaning of Code Section 409A. The Company shall consult with you in good faith regarding the implementation of the provisions of this paragraph. The preceding provisions, however, shall not be construed as a guarantee by the Company of any particular tax effect to you under this Agreement.

2. Arbitration

In the event of any dispute or claim solely related to or arising out of the termination of your employment with the Company for any reason (including, but not limited to, any claims for breach of contract, wrongful termination, or age, sex, race, national origin, disability or other discrimination or harassment), you agree that all such disputes will be fully, finally and exclusively resolved by binding arbitration conducted by Judicial Dispute Resolution, LLC (or a similar entity if acceptable to the Company) in King County, Washington, pursuant to the Federal Arbitration Act. You and the Company hereby waive your respective rights to have any such disputes or claims tried by a judge or jury. This

section will not apply to any claims for injunctive relief by the Company or you, any claims by the Company or you arising out of or related to proprietary and intellectual property rights, claims pursuant to the National Labor Relations Act, claims pursuant to the Washington State Law Against Discrimination, claims under federal discrimination laws, workers compensation claim(s), unemployment compensation benefits claim(s), or any other claims that, as a matter of law, the parties cannot agree to arbitrate.

3. Additional Terms

This Agreement, the Employment Agreement, the Nondisclosure and Assignment Agreement, the Existing Awards and the CIC Agreement (as defined below) constitute the entire agreement between you and the Company regarding the terms and conditions of your employment are the complete and exclusive statement of all of the terms and conditions of your employment with the Company, and supersede and replace any and all prior agreements or representations with regard to the subject matter hereof, whether written or oral, including that certain employment letter agreement by and between you and the Company dated on or about March 17, 2016, and that certain change of control agreement between you and the Company dated on or about August 7, 2017. However, this Agreement shall not supersede the change in control agreement between you and the Company dated on or about May 1, 2019 ("***CIC Agreement***").

This Agreement is entered into without reliance on any promise or representation other than those expressly contained herein, and (except for changes reserved to the Company's discretion herein) cannot be modified or amended except in a writing signed by you and a duly authorized Company representative. Whenever possible, each provision of this Agreement will be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Agreement is held to be invalid, illegal or unenforceable in any respect under any applicable law or rule in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other provision or any other jurisdiction, but this Agreement will be reformed, construed and enforced as if such invalid, illegal or unenforceable provisions had never been contained herein. This Agreement and the terms of your employment with the Company shall be governed in all aspects by the laws of the State of Washington.

[*Signature page follows.*]

Please sign and date this Agreement on the spaces provided below to acknowledge your acceptance of the terms of this Agreement.

Sincerely,

/s/ Chad Robins
Chad Robins
Chief Executive Officer

I agree to and accept the terms and conditions set forth in this Agreement.

/s/ Charles Sang
Charles Sang

Date: May 1, 2019

Exhibit A
Release

[*Separately attached.*]

ADAPTIVE BIOTECHNOLOGIES CORPORATION

INDEMNIFICATION AGREEMENT

This Indemnification Agreement (the "***Agreement***") is entered into on , 20 , between Adaptive Biotechnologies Corporation, a Washington corporation (the "***Company***"), and the undersigned officer and/or director of the Company ("***Indemnitee***"), for good and valuable consideration as set forth below.

RECITALS

A. The Company recognizes the importance, and increasing difficulty, of obtaining adequate liability insurance coverage for its directors, officers, employees, agents and fiduciaries.

B. The Company further recognizes that, at the same time as the availability and coverage of such insurance has become more limited, litigation against corporate directors, officers, employees, agents and fiduciaries has continued to increase.

C. Section 5.4 of Article 5 of the Company's Amended and Restated Articles of Incorporation (the "***Articles***") provides for indemnification of the Company's directors and officers to the full extent authorized by the Washington Business Corporation Act (the "***Statute***"), and that such provisions are not exclusive and may be supplemented by agreements between the Company and its directors, officers, employees and agents.

D. The Company desires to retain and attract the services of highly qualified individuals, such as Indemnitee, to serve the Company and, in that connection, also desires to provide contractually for indemnification of, and advancement of expenses to, Indemnitee to the full extent authorized by law.

AGREEMENT

1. **Indemnification**

a. **Scope.** The Company agrees to hold harmless and indemnify Indemnitee against any Damages (as defined in Section 1(c)) incurred by Indemnitee with respect to any Proceeding (as defined in Section 1(d)) to which Indemnitee is or is threatened to be made a party or in which Indemnitee is otherwise involved (including, but not limited to, as a witness), to the full extent authorized by law, without regard to the limitations in RCW 23B.08.510 through 23B.08.550, and 23B.08.560(2), except that Indemnitee shall have no right to indemnification on account of: (i) acts or omissions of Indemnitee that have been finally adjudged (by a court having proper jurisdiction, and after all rights of appeal have been exhausted or lapsed, herein "***Finally Adjudged***") to be intentional misconduct or a knowing violation of law; (ii) conduct of Indemnitee that has been Finally Adjudged to be in violation of RCW 23B.08.310; (iii) any transaction with respect to which it has been Finally Adjudged that Indemnitee personally received a benefit in money, property or services to which Indemnitee was not legally entitled; or (iv) any suit in which it is Finally Adjudged that Indemnitee is liable for

an accounting of profits made from the purchase or sale by Indemnitee of securities of the Company in violation of the provisions of Section 16(b) of the Securities Exchange Act of 1934 and amendments thereto.

b. **Changes to Indemnification Right.** Indemnitee's right to be indemnified to the full extent authorized by law shall include the benefits of any change, after the date of this Agreement, in the Statute or other applicable law regarding the right of a Washington corporation to indemnify directors, officers, employees or agents, to the extent that it would expand Indemnitee's rights hereunder. Any such change that would narrow or interfere with Indemnitee's rights hereunder shall not apply to, limit, or affect the interpretation of, this Agreement, unless and then only to the extent that it has been Finally Adjudged that its application hereto does not constitute an unconstitutional impairment of Indemnitee's contract rights or otherwise violate applicable law.

c. **Indemnified Amounts.** If Indemnitee is or is threatened to be made a party to, or is otherwise involved (including, but not limited to, as a witness) in, any Proceeding, the Company shall hold harmless and indemnify Indemnitee from and against any and all losses, claims, damages, costs, expenses and liabilities incurred in connection with investigating, defending, being a witness in, participating in or otherwise being involved in (including on appeal), or preparing to defend, be a witness in, participate in or otherwise be involved in (including on appeal), such Proceeding, including but not limited to attorneys' fees, judgments, fines, penalties, ERISA excise taxes, amounts paid in settlement, any federal, state, local or foreign taxes imposed on Indemnitee as a result of the actual or deemed receipt of any payments pursuant to this Agreement, and other expenses (collectively, "***Damages***"), including all interest, assessments or charges paid or payable in connection with or in respect of such Damages.

d. **Definition of Proceeding.** For purposes of this Agreement, "***Proceeding***" shall mean any actual, pending, threatened or completed action, suit, claim, investigation, hearing or proceeding (whether civil, criminal, administrative or investigative, and whether formal or informal) in which Indemnitee is, has been or becomes involved, or regarding which Indemnitee is threatened to be made a named defendant or respondent, based in whole or in part on or arising out of the fact that Indemnitee is or was a director, officer, member of a board committee, employee or agent of the Company and/or any of its subsidiaries or that, being or having been such a director, officer, member of a board committee, employee or agent, Indemnitee is or was serving at the request of the Company as a director, officer, partner, employee, trustee or agent of another corporation or of a foreign or domestic corporation, partnership, joint venture, trust, employee benefit plan or other enterprise (each, a "***Related Company***"), whether the basis of such action, suit, claim, investigation, hearing or proceeding is alleged action or omission by Indemnitee in an official capacity as a director, officer, committee member, partner, employee, trustee or agent or in any other capacity while serving as a director, officer, committee member, partner, employee, trustee or agent. "Proceeding" shall not, however, include any action, suit, claim, investigation, hearing or proceeding instituted by or at the direction of Indemnitee unless pursuant to an Enforcement Action (as defined in Section 3(a)) or its institution has been authorized by the Company's Board of Directors (the "***Board***").

e. **Notifications**.

i. Promptly after receipt by Indemnitee of notice of the commencement (including a threatened assertion or commencement) of any Proceeding, Indemnitee will, if it is reasonably foreseeable that a claim in respect thereof will be made against the Company under this Agreement, notify the Board of the commencement thereof (which notice shall be in the form of attached Exhibit A) (the "***Indemnification Notice***"). A failure to notify the Company in accordance with this Section 1(e)(i) will not, however, relieve the Company from any liability to Indemnitee under this Agreement unless (and then only to the extent that) such failure is Finally Adjudged to have materially prejudiced the Company's ability to defend the Proceeding.

ii. At the same time, or from time to time thereafter, Indemnitee may further notify the Board, by delivery of a supplemental Indemnification Notice (or by checking the second box and providing the corresponding information on the initial Indemnification Notice), of any Proceeding for which indemnification is being sought under this Agreement.

f. **Determination of Entitlement**.

i. To the extent Indemnitee has been wholly successful, on the merits or otherwise, in the defense of any Proceeding, the Company shall indemnify Indemnitee against all expenses incurred by Indemnitee in connection with the Proceeding, within ten (10) days after receipt of an Indemnification Notice delivered pursuant to subsection (e)(ii).

ii. In the event that subsection (f)(i) above is inapplicable, or does not apply to the entire Proceeding, the Company shall indemnify Indemnitee within thirty (30) days after receipt of an Indemnification Notice delivered pursuant to subsection (e)(ii) unless during such thirty (30) day period the Board delivers to Indemnitee a written notice contesting Indemnitee's indemnification claim (the "***Contest Notice***"), which Contest Notice shall state with particularity the reasons for the decision to challenge Indemnitee's indemnification claim and the evidence the Company would present in any forum in which Indemnitee might seek review of such decision. The Company's failure to deliver a Contest Notice within thirty (30) days after the Company's receipt of an Indemnification Notice pursuant to subsection (e)(ii) shall obligate the Company unconditionally to indemnify Indemnitee to the extent requested in the Indemnification Notice.

iii. At any time following receipt of a Contest Notice, Indemnitee shall be entitled to select a forum for the review of, and in which the Company will defend, the Contest Notice and the Company's decision to challenge Indemnitee's indemnification claim. Such selection shall be made from among the following alternatives, by delivering a written notice to the Board indicating Indemnitee's selection of forum:

(A) A quorum of the Board consisting of directors who are not parties to the Proceeding for which indemnification is being sought;

(B) Special Legal Counsel (as defined in Section 1(f)(vii)); or

(C) A panel of three independent arbitrators, one of whom is selected by the Company, another of whom is selected by Indemnitee and the last of whom is selected by the first two arbitrators so selected, provided, that nothing in this Section 1(f) shall prevent Indemnitee at any time from bringing suit against the Company to recover the amount of the indemnification claim (whether or not Indemnitee has otherwise exhausted its contractual remedies hereunder). In addition, any determination by a forum selected by Indemnitee that Indemnitee is not entitled to indemnification, or any failure to make the payments requested in the Indemnification Notice, shall be subject to judicial review by any court of competent jurisdiction, as described in Section 3.

iv. In any forum in which the Company defends its Contest Notice and its decision to challenge Indemnitee's indemnification claim under this Section 1(f), the presumptions, burdens and standard of review set forth in Section 3(c) shall apply and are incorporated into this Section 1(f) by reference, except as otherwise expressly provided in Section 3(c).

v. As soon as practicable, and in no event later than fifteen (15) days after the forum has been selected pursuant to subsection (f)(iii) above, the Company shall, at its own expense, submit the defense of its Contest Notice and the question of Indemnitee's right to indemnification to the selected forum.

vi. The forum selected shall render its decision concerning the validity of the Contest Notice and the Company's decision to deny Indemnitee's indemnification claim within thirty (30) days after the forum has been selected in accordance with Section 1(f)(iii).

vii. For the purposes of this Agreement, "***Special Legal Counsel***" shall mean an attorney or firm of attorneys, selected by Indemnitee and approved by the Company (which approval shall not be unreasonably withheld), who must not have performed other services for the Company or Indemnitee within the last three years.

2. **Expense Advances**

a. **Generally.** The right to indemnification conferred by Section 1 shall include the right to have the Company pay Indemnitee's attorneys' fees and other expenses, including but not limited to out of pocket costs and disbursements, incurred in connection with any Proceeding, or in connection with bringing, defending and/or pursuing an Enforcement Action (as defined in Section 3(a)), as such expenses are incurred and in advance of the final disposition of such Proceeding or Enforcement Action (such entitlement is referred to hereinafter as an "***Expense Advance***").

b. **Undertaking.** The Company's obligation to provide an Expense Advance is subject only to the following condition: Indemnitee or his or her representative must have executed and delivered to the Board an undertaking (in the form of attached Exhibit B) (the "***Statement of Undertaking***") to repay all Expense Advances if and to the extent that it may be Finally Adjudged that Indemnitee is not entitled to be indemnified for such Expense Advance under one or more of clauses (i) through (iv) of the first sentence of Section 1(a). The Statement of Undertaking need not be secured and shall be accepted by the Company without reference to Indemnitee's financial ability to make repayment. No interest shall be charged on any obligation to reimburse the Company for any Expense Advance.

c. **Service as Witness.** Notwithstanding any other provision of this Agreement, the Company's obligation to indemnify, or provide Expense Advances under Section 2, to Indemnitee in connection with Indemnitee's appearance as a witness in a Proceeding at a time when Indemnitee has not been made a named defendant or respondent to the Proceeding shall be absolute and unconditional, and not subject to any of the limitations on, or conditions to, Indemnitee's right to indemnification or to receive an Expense Advance otherwise contained in this Agreement.

3. **Procedures for Enforcement**

a. **Enforcement.** If a claim for indemnification made by Indemnitee hereunder is not paid in full (whether or not the provisions of Section 1(f) have been complied with, or completed), or a claim for an Expense Advance made by Indemnitee hereunder is not paid in full within twenty (20) days from delivery of a Statement of Undertaking to the Board, Indemnitee may, but need not, at any time thereafter bring suit against the Company to recover the unpaid amount of the claim (an "***Enforcement Action***").

b. **Required Indemnification.** The court hearing the Enforcement Action shall order the Company to provide indemnification or to advance expenses to Indemnitee to the full extent sought in the Enforcement Action if it determines that (i) the Enforcement Action is brought by Indemnitee to enforce the Company's obligation under Section 1(f)(ii) unconditionally to indemnify Indemnitee to the extent requested in the Indemnification Notice where the Company has failed timely to deliver a Contest Notice, or (ii) the Company failed to prove by clear and convincing evidence that Indemnitee is not entitled to indemnification based on one or more of clauses (i) through (iv) of the first sentence of Section 1(a).

c. **Presumptions, Burdens and Standard of Review in Enforcement Action or Company Determination.** In any Enforcement Action (and, except as otherwise expressly provided in this Section 3(c), in any review of a Contest Notice by a forum described in Section 1(f)) the following presumptions (and limitations on presumptions), burdens and standard of review shall apply:

i. The Company shall conclusively be presumed to have entered into this Agreement and assumed the obligations imposed hereunder in order to induce Indemnitee to serve or to continue to serve as a director, officer, member of a board committee, employee and/or agent of the Company and/or one or more of its subsidiaries;

ii. This Agreement shall conclusively be presumed to be valid and Article 5 of the Articles shall conclusively be presumed to be effective to waive all of the limitations in RCW 23B.08.510 through RCW 23B.08.550, and RCW 23B.08.560(2);

iii. Submission of an Indemnification Notice in accordance with Section 1(e)(ii) or a Statement of Undertaking to the Company shall create a presumption that Indemnitee is entitled to indemnification or an Expense Advance hereunder, and thereafter the Company shall have the burden of proving by clear and convincing evidence (sufficient to rebut the foregoing presumption) that Indemnitee is not entitled to indemnification based on one or more of clauses (i) through (iv) of the first sentence of Section 1(a);

iv. Indemnitee may establish a conclusive presumption of any objective fact related to an event or occurrence by delivering to the Company a declaration made under penalty of perjury that such fact is true, provided, that no such presumption may be established with respect to the ultimate conclusions set forth in any of clauses (i) through (iv) of the first sentence of Section 1(a);

v. If Indemnitee is or was serving as a director, officer, employee, trustee or agent of a corporation of which a majority of the shares entitled to vote in the election of its directors is held by the Company or in an executive or management capacity in a partnership, joint venture, trust or other enterprise of which the Company or a wholly-owned subsidiary of the Company is a general partner or has a majority ownership, then such corporation, partnership, joint venture, trust or enterprise shall conclusively be deemed a Related Company and Indemnitee shall conclusively be deemed to be serving such Related Company at the request of the Company;

vi. Neither (i) the failure of the Company (including but not limited to the Board, the Company's officers, independent counsel, Special Legal Counsel, any arbitrator or the Company's shareholders) to make a determination prior to the commencement of the Enforcement Action whether indemnification, or payment of an Expense Advance, of Indemnitee is proper in the circumstances nor (i) an actual determination by the Company, the Board, the Company's officers, independent counsel, Special Legal Counsel, any arbitrator or the Company's shareholders that Indemnitee is not entitled to indemnification or payment of an Expense Advance shall be a defense to the Enforcement Action, create a presumption that Indemnitee is not entitled to indemnification hereunder or be considered by a court in an Enforcement Action, which shall conduct a de novo review of the relevant issues;

vii. The termination of any Proceeding by judgment, order, settlement (whether with or without court approval) or conviction, or upon a plea of nolo contendere, or its equivalent, shall not create a presumption that Indemnitee did not meet any particular standard of conduct or have a particular belief or that a court has determined that indemnification is not permitted under this Agreement or applicable law; and

viii. If the court hearing the Enforcement Action is unable to make either of the determinations specified in Sections 3(b)(i) or 3(b)(ii), the court hearing the Enforcement Action shall nonetheless order the Company to provide indemnification or to advance expenses to Indemnitee to the full extent sought in the Enforcement Action if it determines that Indemnitee is fairly and reasonably entitled to such indemnification or Expense Advance in view of all of the relevant circumstances, and without regard to the limitations set forth in clauses (i) through (iii) of the first sentence of Section 1(a). In determining whether Indemnitee is fairly and reasonably entitled to such indemnification or expense advance, the court shall weigh (i) the relative benefits received by the Company and/or any of its subsidiaries or any Related Company, or any of their affiliates other than Indemnitee, on the one hand, and Indemnitee on the other from the transaction from which such Proceeding arose or to which such Proceeding relates, and (ii) the relative fault of the Company and/or any of its subsidiaries or any

Related Company, or any of their affiliates other than Indemnitee, on the one hand, and of Indemnitee on the other in connection with the transaction that resulted in such Damages, as well as any other relevant equitable considerations. The relative fault of the Company and/or any of its subsidiaries or any Related Company, or any of their affiliates other than Indemnitee, on the one hand, and of Indemnitee on the other shall be determined by reference to, among other things, the parties' relative intent, knowledge, access to information and opportunity to correct or prevent the circumstances resulting in such Damages. If either (i) the relative benefits received by the Company and/or any of its subsidiaries or any Related Company, or any of their affiliates other than Indemnitee, exceed the relative benefits received by Indemnitee, or (ii) the relative fault of the Company and/or any of its subsidiaries or any Related Company, or any of their affiliates other than Indemnitee, exceeds the relative fault of Indemnitee, then Indemnitee shall be entitled to the full amount of indemnification and/or Expense Advance sought in the Enforcement Proceeding.

d. **Attorneys' Fees and Expenses for Enforcement Action.** In any Enforcement Action, the Company shall hold harmless and indemnify Indemnitee against all of Indemnitee's attorneys' fees and expenses in bringing, defending and/or pursuing the Enforcement Action (including but not limited to attorneys' fees at any stage, and on appeal); provided, however, that the Company shall not be required to provide such indemnification for such fees and expenses if it is Finally Adjudged that Indemnitee knew prior to commencement of the Enforcement Action that Indemnitee was not entitled to indemnification based on any of clauses (i) through (iv) of the first sentence of Section 1(a).

4. **Defense of Claim**

With respect to any Proceeding as to which Indemnitee has provided notice to the Company pursuant to Section 1(e)(i):

a. The Company may participate therein at its own expense.

b. The Company (jointly with any other indemnifying party similarly notified, if any) may assume the defense thereof, with counsel reasonably satisfactory to Indemnitee. After notice from the Company to Indemnitee of its election to so assume the defense thereof, the Company shall not be liable to Indemnitee under this Agreement for any legal fees or other expenses (other than reasonable costs of investigation and costs and expenses as participating as a witness) subsequently incurred by Indemnitee in connection with the defense thereof unless (i) the employment of counsel by Indemnitee or the incurring of such expenses has been authorized by the Company, (ii) Indemnitee shall have concluded that there is a reasonable possibility that a conflict of interest could arise between the Company and Indemnitee in the conduct of the defense of such Proceeding, which conflict of interest shall be conclusively presumed to exist upon Indemnitee's delivery to the Company of a written certification of such conclusion, (iii) the Company shall not in fact have employed counsel to assume the defense of such Proceeding or (iv) the Company does not continue to retain such counsel to defend such Proceeding, in each of which cases the legal fees and other expenses of Indemnitee shall be at the expense of the Company. The Company shall not be entitled to assume the defense of a Proceeding brought by or on behalf of the Company or as to which Indemnitee shall have reached the conclusion described in clause (ii) above.

c. The Company shall not be liable for any amounts paid in settlement of any Proceeding effected without its written consent.

d. The Company shall not settle any Proceeding in any manner that (i) would impose any penalty or limitation on Indemnitee, (ii) constitute any admission of wrongdoing of Indemnitee, or (iii) may compromise or adversely affect the defense of the Indemnitee in any other Proceeding, in each case without Indemnitee's written consent.

e. Neither the Company nor Indemnitee will unreasonably withhold its or his or her consent to any proposed settlement of any Proceeding.

5. **Maintenance of D&O Insurance**

a. Subject to Section 5(c) below, during the period (the "***Coverage Period***") beginning on the date of this Agreement and ending at the later of (i) six (6) years following the time Indemnitee is no longer serving as a director, officer, member of a board committee, employee or agent of the Company and/or one or more subsidiaries or any Related Company, or (ii) at the end of such longer period during which Indemnitee believes that a reasonable possibility of exposure to a Proceeding or Damages persists (which extended period must be consented to by the Company, such consent not to be unreasonably withheld), the Company shall maintain a directors' and officers' liability insurance policy in full force and effect or shall have purchased or otherwise provided for a run-off or tail policy or endorsement to such existing policy ("***D&O Insurance***"), providing in all respects coverage at least comparable to and in similar amounts, and with similar exclusions, as that obtained by other similarly situated companies as determined in good faith by any of the parties referenced in Section 1(f)(iii)(a) through (c).

b. Under all policies of D&O Insurance, Indemnitee shall during the Coverage Period be named as an insured in such a manner as to provide Indemnitee the same rights and benefits, subject to the same limitations, as are accorded to the Company's directors or officers most favorably insured by such policy, and each insurer under a policy of D&O Insurance shall be required to provide Indemnitee written notice at least thirty (30) days prior to the effective date of termination of the policy.

c. Unless otherwise expressly provided in a written agreement between the Company and Indemnitee, the Company shall have no obligation to obtain or maintain D&O Insurance to the extent that such insurance is not reasonably available, the premium costs for such insurance are disproportionate to the amount of coverage provided, or the coverage provided by such insurance is so limited by exclusions as to provide an insufficient benefit, such determination to be made by any of the parties referenced in Section 1(f)(iii)(a) through (c).

d. It is the intention of the parties in entering into this Agreement that the insurers under the D&O Insurance, if any, shall be obligated ultimately to pay any claims by Indemnitee which are covered by D&O Insurance, and nothing herein shall be deemed to diminish or otherwise restrict the Company's or Indemnitee's right to proceed or collect against any insurers under D&O Insurance or to give such insurers any rights against the Company or Indemnitee under or with respect to this Agreement, including but not limited to any right to be

subrogated to the Company's or Indemnitee's rights hereunder, unless otherwise expressly agreed to by the Company and Indemnitee in writing. The obligation of such insurers to the Company and Indemnitee shall not be deemed reduced or impaired in any respect by virtue of the provisions of this Agreement.

e. Subject to Section 7, the Company shall not provide indemnification pursuant to this Agreement for Damages or Expense Advances that have been paid directly to Indemnitee by an insurance carrier under a policy of D&O Insurance or other insurance maintained by the Company.

f. Subject to Section 7, in the event of payment under this Agreement, the Company shall be subrogated to the extent of such payment to all of the rights of Indemnitee to recover the same amounts from any insurer or other third person (other than another person with indemnification rights against the Company substantially similar those of Indemnitee under this Agreement). Indemnitee shall execute all documents required and take all acts necessary to secure such rights and enable the Company effectively to bring suit to enforce such rights.

6. **Partial Indemnification; Mutual Acknowledgment; Contribution**

a. **Partial Indemnification.** If Indemnitee is entitled under any provision of this Agreement to indemnification by the Company for some or a portion of any Damages in connection with a Proceeding, but not for the total amount thereof, the Company shall nevertheless indemnify Indemnitee for the portion of such Damages to which Indemnitee is entitled.

b. **Mutual Acknowledgment.** The Company and Indemnitee acknowledge that, in certain instances, federal law or public policy may override applicable state law and prohibit the Company from indemnifying Indemnitee under this Agreement or otherwise. For example, the Company and Indemnitee acknowledge that the Securities and Exchange Commission (the "***SEC***") has taken the position that indemnification is not permissible for liabilities arising under certain federal securities laws, and federal legislation prohibits indemnification for certain ERISA violations. Furthermore, Indemnitee understands that the Company has undertaken or may be required in the future to undertake with the SEC to submit for judicial determination the issue of the Company's power to indemnify Indemnitee in certain circumstances; all of the Company's obligations under this Agreement will be subject to the requirements of any such undertaking required by the SEC to be made by the Company.

c. **Contribution.** If the indemnification provided under Sections 1, 2 and 6 is unavailable by reason of any of the circumstances specified in one or more of clauses (i) through (iii) of the first sentence of Section 1(a) then, in respect of any Proceeding in which the Company is jointly liable with Indemnitee (or would be if joined in such Proceeding), the Company shall contribute to the amount of Damages (including attorneys' fees) actually and reasonably incurred and paid or payable by Indemnitee in such proportion as is appropriate to reflect (i) the relative benefits received by the Company and/or any of its subsidiaries or any Related Company, or any of their affiliates other than Indemnitee, on the one hand, and Indemnitee on the other from the transaction or events from which such Proceeding arose or to which such Proceeding relates, and (ii) the relative fault of the Company and/or any of its

subsidiaries or any Related Company, or any of their affiliates other than Indemnitee, on the one hand, and of Indemnitee on the other in connection with the transaction or events that resulted in such Damages, as well as any other relevant equitable considerations. The relative fault of the Company and/or any of its subsidiaries or any Related Company, or any of their affiliates other than Indemnitee, on the one hand, and of Indemnitee on the other shall be determined by reference to, among other things, the parties' relative intent, knowledge, access to information and opportunity to correct or prevent the circumstances resulting in such Damages. The Company agrees that it would not be just and equitable if contribution pursuant to this Section 6(c) were determined by pro rata allocation or any other method of allocation that does not take account of the foregoing equitable considerations.

7. **Primacy of Indemnification**

The Company hereby acknowledges that the Indemnitee may have certain rights to indemnification, advancement of expenses or liability insurance provided by a third-party and certain of its affiliates, other than the Company, any Related Company or the insurer under a D&O Insurance policy of the Company or any Related Company (collectively, the "***Entity Indemnitors***"). The Company hereby agrees that the Company shall, and to the extent applicable shall cause each Related Company to, (i) be the indemnitor of first resort, i.e., its obligations to Indemnitee under this Agreement (including, without limitation, indemnification for Damages and the obligation to make Expense Advances) and any indemnity provisions set forth in its Certificate of Incorporation, By-laws or elsewhere (collectively, "***Indemnity Arrangements***") are primary and (ii) advance the full amount of expenses incurred by the Indemnitee and shall be liable for the full amount of all expenses, judgments, penalties, fines and amounts paid in settlement by or on behalf of the Indemnitee, to the extent legally permitted and as required by any Indemnity Arrangement, without regard to any rights the Indemnitee may have against the Entity Indemnitors. The Company hereby irrevocably waives, relinquishes and releases, and shall cause each Related Company to irrevocably waive, relinquish and release, the Entity Indemnitors from any claims against the Entity Indemnitors for contribution, subrogation or any other recovery of any kind arising out of or relating to any Indemnity Arrangement. The Company further agrees that no advancement or indemnification payment by any Entity Indemnitor on behalf of the Indemnitee shall affect the foregoing. Additionally, the Entity Indemnitors shall be subrogated to the extent of such advancement or payment to all of the rights of recovery of the Indemnitee against the Company. In the event that any Entity Indemnitor makes a payment to the Indemnitee in respect of indemnification or advancement of expenses where the Company or a Related Company is the indemnitor of first resort, the Company shall, and to the extent applicable shall cause the Related Companies to, promptly and fully reimburse the Entity Indemnitor making such payment upon written demand by the Entity Indemnitor . The Company and the Indemnitee agree that the Entity Indemnitors are express third party beneficiaries of the terms of this Section 7, entitled to enforce this Section 7 as though each such Entity Indemnitor were a party to this Agreement. The Company shall cause each of the Related Companies to perform the terms and obligations of this Section 7 as though each such Related Company was a party to this Agreement

8. **Miscellaneous**

a. This Agreement shall be interpreted and enforced in accordance with the laws of the State of Washington.

b. This Agreement shall be binding upon Indemnitee and upon the Company, its successors and assigns, and shall inure to the benefit of Indemnitee, Indemnitee's heirs, personal representatives and assigns and to the benefit of the Company, its successors and assigns. The Company shall require any successor to the Company (whether direct or indirect, by purchase, merger, consolidation or otherwise) to all or substantially all of the business or assets of the Company, expressly to assume and agree to perform this Agreement in the same manner and to the same extent that the Company would be required to perform if no such succession had taken place.

c. Indemnitee's rights to indemnification and advancement of expenses under this Agreement shall not be deemed exclusive of any other or additional rights to which Indemnitee may be entitled under the Articles or the Bylaws of the Company, any vote of shareholders or disinterested directors, the Statute or otherwise, whether as to actions or omissions in Indemnitee's official capacity or otherwise.

d. Nothing in this Agreement shall confer upon Indemnitee the right to continue to serve as a director, officer, member of a Board committee, employee and/or agent of the Company or any of its subsidiaries or any Related Company. If Indemnitee is an officer or employee of the Company, then, unless otherwise expressly provided in a written employment agreement between the Company and Indemnitee, the employment of Indemnitee with the Company shall be terminable at will by either party. The indemnification and release provided under this Agreement shall apply to any and all Proceedings, notwithstanding that Indemnitee has ceased to be a director, officer, partner, employee, trustee or agent of the Company, any of its subsidiaries or a Related Company, and shall inure to the benefit of the heirs, executors and administrators of Indemnitee.

e. If any provision or provisions of this Agreement shall be held to be invalid, illegal or unenforceable for any reason whatsoever, then: (i) the validity, legality and enforceability of the remaining provisions of this Agreement (including, without limitation, all portions of any paragraphs of this Agreement containing any such invalid, illegal or unenforceable provision that are not themselves invalid, illegal or unenforceable) shall not in any way be affected or impaired thereby; and (ii) to the fullest extent possible, the provisions of this Agreement (including, without limitation, all portions of any paragraphs of this Agreement containing any such invalid, illegal or unenforceable provision, that are not themselves invalid, illegal or unenforceable) shall be construed so as to give effect to the intent manifested by the provision held invalid, illegal or unenforceable.

f. Any notices or communications to be given or required to be given under this Agreement shall be given by personal delivery, registered mail, overnight courier, facsimile or electronic mail at the following address or at the address following Indemnitee's signature below.

Company:

Adaptive Biotechnologies Corporation
1551 Eastlake Ave. E, #200
Seattle, WA 98102
Attn: Legal Department
Electronic mail:

Notices and communications shall be deemed received by the addressee on the date of delivery if delivered in person, on the third (3rd) day after mailing if delivered by registered airmail, on the next business day after mailing if sent by overnight courier, on the next business day if sent by telex or facsimile, or upon confirmation of delivery when directed to the electronic mail address described above if sent by electronic mail.

g. No amendment, modification, termination or cancellation of this Agreement shall be effective unless in writing signed by both parties hereto.

h. If Indemnitee has previously executed an indemnification agreement with the Company, this Agreement supersedes such prior indemnification agreement in its entirety.

i. This Agreement may be executed in two counterparts, each of which shall be deemed an original, but both of which together shall constitute one and the same instrument.

[*Signature page to follow.*]

IN WITNESS WHEREOF, the parties have executed and delivered this Agreement effective as of the day and year first set forth above.

"Company"

ADAPTIVE BIOTECHNOLOGIES CORPORATION

By: _____
Name: Chad Robins
Its: Chief Executive Officer

"Indemnitee"

Print Name: _____
Address: _____
_____
Fax: _____
Telephone: _____
Email: _____

EXHIBIT A

INDEMNIFICATION NOTICE

Check the appropriate space below, and provide a brief description of the Proceeding as requested below:

☐ Notice is hereby given by the undersigned, _____, pursuant to Section 1(e)(i) of the Indemnification Agreement (the "***Agreement***") dated _____between Adaptive Biotechnologies Corporation, a Washington corporation (the "***Company***"), and the undersigned, of the commencement of a Proceeding, as defined in the Agreement. A brief description of the Proceeding is as follows:

☐ If indemnification of particular Damages (as defined in the Agreement) is being sought at this time, pursuant to Section 1(e)(ii) of the Agreement, the undersigned hereby requests indemnification by the Company under the terms of the Agreement with respect to the following Damages incurred in connection with the Proceeding:

Dated: _____, _____.

_____

[*Signature of Indemnitee*]

_____

[*Print name*]

EXHIBIT B

STATEMENT OF UNDERTAKING

STATE OF_____)
) ss.
COUNTY OF_____)

I, _____, being first duly sworn, do depose and say as follows:

1. This Statement is submitted pursuant to the Indemnification Agreement (the "***Agreement***") dated _____ between Adaptive Biotechnologies Corporation, a Washington corporation (the "***Company***"), and me.

2. I am requesting an Expense Advance, as defined in the Agreement.

3. I hereby undertake to repay the Expense Advance if and to the extent it is Finally Adjudged (as defined in the Agreement) that I am not entitled under the Agreement to be indemnified by the Company.

4. The expenses for which advancement is requested, and a brief description of the underlying Proceeding (as defined in the Agreement), are as follows: **[Add brief description of expenses and Proceeding]**

DATED: _____, _____

_____
[*Signature*]

SUBSCRIBED AND SWORN TO before me this ____day of _____.

(Seal or stamp)

_____
Notary Signature

_____
Print/Type Name
Notary Public in and for the State of Washington,
residing at _____
_____

My appointment expires _____

Exhibit 10.15

ADAPTIVE BIOTECHNOLOGIES CORPORATION

2009 EQUITY INCENTIVE PLAN

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Adaptive Biotechnologies Corporation
2009 Equity Incentive Plan

1. **ESTABLISHMENT, PURPOSE AND TERM OF PLAN.**

1.1 **Establishment.** The Adaptive Biotechnologies Corporation 2009 Equity Incentive Plan (the *"**Plan**"*) is hereby established effective as of December 17, 2009, the date of its approval by the stockholders of the Company (the *"**Effective Date**"*).

1.2 **Purpose.** The purpose of the Plan is to advance the interests of the Participating Company Group and its stockholders by providing an incentive to attract, retain and reward persons performing services for the Participating Company Group and by motivating such persons to contribute to the growth and profitability of the Participating Company Group. The Plan seeks to achieve this purpose by providing for Awards in the form of Options, Stock Appreciation Rights, Restricted Stock Purchase Rights, Restricted Stock Bonuses, Restricted Stock Units, Performance Shares, Performance Units, Cash-Based Awards and Other Stock-Based Awards.

1.3 **Term of Plan.** The Plan shall continue in effect until its termination by the Committee; provided, however, that all Awards shall be granted, if at all, within ten (10) years from the Effective Date.

2. **DEFINITIONS AND CONSTRUCTION.**

2.1 **Definitions.** Whenever used herein, the following terms shall have their respective meanings set forth below:

(a) *"**Affiliate**"* means (i) an entity, other than a Parent Corporation, that directly, or indirectly through one or more intermediary entities, controls the Company or (ii) an entity, other than a Subsidiary Corporation, that is controlled by the Company directly or indirectly through one or more intermediary entities. For this purpose, the term "control" (including the term "controlled by") means the possession, direct or indirect, of the power to direct or cause the direction of the management and policies of the relevant entity, whether through the ownership of voting securities, by contract or otherwise; or shall have such other meaning assigned such term for the purposes of registration on Form S-8 under the Securities Act.

(b) *"**Award**"* means any Option, Stock Appreciation Right, Restricted Stock Purchase Right, Restricted Stock Bonus, Restricted Stock Unit, Performance Share, Performance Unit, Cash-Based Award or Other Stock-Based Award granted under the Plan.

(c) *"**Award Agreement**"* means a written or electronic agreement between the Company and a Participant setting forth the terms, conditions and restrictions of the Award granted to the Participant.

(d) *"**Board**"* means the Board of Directors of the Company.

(e) *"**Cash-Based Award**"* means an Award denominated in cash and granted pursuant to Section 11.

(f) *"**Cause**"* means, unless such term or an equivalent term is otherwise defined with respect to an Award by the Participant's Award Agreement or by a written contract of employment or service, any of the following: (i) the Participant's theft, dishonesty, willful misconduct, breach of fiduciary duty for personal profit, or falsification of any Participating Company documents or records; (ii) the Participant's material failure to abide by a Participating Company's code of conduct or other policies (including, without limitation, policies relating to confidentiality and reasonable workplace conduct); (iii) the Participant's unauthorized use, misappropriation, destruction or diversion of any tangible or intangible asset or corporate opportunity of a Participating Company (including, without limitation, the Participant's improper use or disclosure of a Participating Company's confidential or proprietary information); (iv) any intentional act by the Participant which has a material detrimental effect on a Participating Company's reputation or business; (v) the Participant's repeated failure or inability to perform any reasonable assigned duties after written notice from a Participating Company of, and a reasonable opportunity to cure, such failure or inability; (vi) any material breach by the Participant of any employment, service, non-disclosure, non-competition, non-solicitation or other similar agreement between the Participant and a Participating Company, which breach is not cured pursuant to the terms of such agreement; or (vii) the Participant's conviction (including any plea of guilty or nolo contendere) of any criminal act involving fraud, dishonesty, misappropriation or moral turpitude, or which impairs the Participant's ability to perform his or her duties with a Participating Company.

(g) *"**Change in Control**"* means, unless such term or an equivalent term is otherwise defined with respect to an Award by the Participant's Award Agreement or by a written contract of employment or service, the occurrence of any of the following:

(i) any "person" (as such term is used in Sections 13(d) and 14(d) of the Exchange Act) becomes the "beneficial owner" (as such term is defined in Rule 13d-3 promulgated under the Exchange Act), directly or indirectly, of securities of the Company representing more than fifty percent (50%) of the total Fair Market Value or total combined voting power of the Company's then-outstanding securities entitled to vote generally in the election of Directors; provided, however, that a Change in Control shall not be deemed to have occurred if such degree of beneficial ownership results from any of the following: (A) an acquisition by any person who on the Effective Date is the beneficial owner of more than fifty percent (50%) of such voting power, (B) any acquisition directly from the Company, including, without limitation, pursuant to or in connection with a public offering of securities, (C) any acquisition by the Company, (D) any acquisition by a trustee or other fiduciary under an employee benefit plan of a Participating Company or (E) any acquisition by an entity owned directly or indirectly by the stockholders of the Company in substantially the same proportions as their ownership of the voting securities of the Company; or

(ii) an Ownership Change Event or series of related Ownership Change Events (collectively, a *"**Transaction**"*) in which the stockholders of the Company immediately before the Transaction do not retain immediately after the Transaction direct or indirect beneficial ownership of more than fifty percent (50%) of the total combined voting

power of the outstanding securities entitled to vote generally in the election of Directors or, in the case of an Ownership Change Event described in Section 2.1(cc)(iii), the entity to which the assets of the Company were transferred (the "***Transferee***"), as the case may be; or

(iii) a liquidation or dissolution of the Company;

provided, however, that a Change in Control shall be deemed not to include a transaction described in subsections (i) or (ii) of this Section 2.1(g) in which a majority of the members of the board of directors of the continuing, surviving or successor entity, or parent thereof, immediately after such transaction is comprised of Incumbent Directors. For purposes of the preceding sentence, indirect beneficial ownership shall include, without limitation, an interest resulting from ownership of the voting securities of one or more corporations or other business entities which own the Company or the Transferee, as the case may be, either directly or through one or more subsidiary corporations or other business entities. The Committee shall determine whether multiple sales or exchanges of the voting securities of the Company or multiple Ownership Change Events are related, and its determination shall be final, binding and conclusive.

(h) "***Code***" means the Internal Revenue Code of 1986, as amended, and any applicable regulations or administrative guidelines promulgated thereunder.

(i) "***Committee***" means the Compensation Committee and such other committee or subcommittee of the Board, if any, duly appointed to administer the Plan and having such powers in each instance as shall be specified by the Board. If, at any time, there is no committee of the Board then authorized or properly constituted to administer the Plan, the Board shall exercise all of the powers of the Committee granted herein, and, in any event, the Board may in its discretion exercise any or all of such powers.

(j) "***Company***" means Adaptive Biotechnologies Corporation, a Washington corporation formerly known as Adaptive TCR Corporation, or any successor corporation thereto.

(k) "***Consultant***" means a person engaged to provide consulting or advisory services (other than as an Employee or a member of the Board) to a Participating Company, provided that the identity of such person, the nature of such services or the entity to which such services are provided would not preclude the Company from offering or selling securities to such person pursuant to the Plan in reliance on registration on Form S-8 under the Securities Act.

(l) "***Director***" means a member of the Board.

(m) "***Disability***" means the permanent and total disability of the Participant, within the meaning of Section 22(e)(3) of the Code.

(n) "***Dividend Equivalent Right***" means the right of a Participant, granted at the discretion of the Committee or as otherwise provided by the Plan, to receive a credit for the account of such Participant in an amount equal to the cash dividends paid on one share of Stock for each share of Stock represented by an Award held by such Participant.

(o) "***Employee***" means any person treated as an employee (including an Officer or a member of the Board who is also treated as an employee) in the records of a Participating Company and, with respect to any Incentive Stock Option granted to such person, who is an employee for purposes of Section 422 of the Code; provided, however, that neither service as a member of the Board nor payment of a director's fee shall be sufficient to constitute employment for purposes of the Plan. The Company shall determine in good faith and in the exercise of its discretion whether an individual has become or has ceased to be an Employee and the effective date of such individual's employment or termination of employment, as the case may be. For purposes of an individual's rights, if any, under the terms of the Plan as of the time of the Company's determination of whether or not the individual is an Employee, all such determinations by the Company shall be final, binding and conclusive as to such rights, if any, notwithstanding that the Company or any court of law or governmental agency subsequently makes a contrary determination as to such individual's status as an Employee.

(p) "***Exchange Act***" means the Securities Exchange Act of 1934, as amended.

(q) "***Fair Market Value***" means, as of any date, the value of a share of Stock or other property as determined by the Committee, in its discretion, or by the Company, in its discretion, if such determination is expressly allocated to the Company herein, subject to the following:

(i) Except as otherwise determined by the Committee, if, on such date, the Stock is listed or quoted on a national or regional securities exchange or quotation system, the Fair Market Value of a share of Stock shall be the closing price of a share of Stock as quoted on the national or regional securities exchange or quotation system constituting the primary market for the Stock, as reported in *The Wall Street Journal* or such other source as the Company deems reliable. If the relevant date does not fall on a day on which the Stock has traded on such securities exchange or quotation system, the date on which the Fair Market Value shall be established shall be the last day on which the Stock was so traded or quoted prior to the relevant date, or such other appropriate day as shall be determined by the Committee, in its discretion.

(ii) Notwithstanding the foregoing, the Committee may, in its discretion, determine the Fair Market Value on the basis of the opening, closing, or average of the high and low sale prices of a share of Stock on such date or the preceding trading day, the actual sale price of a share of Stock received by a Participant, any other reasonable basis using actual transactions in the Stock as reported on a national or regional securities exchange or quotation system, or on any other basis consistent with the requirements of Section 409A. The Committee may vary its method of determination of the Fair Market Value as provided in this Section for different purposes under the Plan to the extent consistent with the requirements of Section 409A.

(iii) If, on such date, the Stock is not listed or quoted on a national or regional securities exchange or quotation system, the Fair Market Value of a share of Stock shall be as determined by the Committee in good faith without regard to any restriction other than a restriction which, by its terms, will never lapse, and in a manner consistent with the requirements of Section 409A.

(r) "***Full Value Award***" means any Award settled in Stock, other than (i) an Option, (ii) a Stock Appreciation Right, or (iii) a Restricted Stock Purchase Right or an Other Stock-Based Award under which the Company will receive monetary consideration equal to the Fair Market Value (determined on the effective date of grant) of the shares subject to such Award.

(s) "***Incentive Stock Option***" means an Option intended to be (as set forth in the Award Agreement) and which qualifies as an incentive stock option within the meaning of Section 422(b) of the Code.

(t) "***Incumbent Director***" means a director who either (i) is a member of the Board as of the Effective Date, or (ii) is elected, or nominated for election, to the Board with the affirmative votes of at least a majority of the Incumbent Directors at the time of such election or nomination, but who was not elected or nominated in connection with an actual or threatened proxy contest relating to the election of directors of the Company.

(u) "***Insider***" means an Officer, Director or any other person whose transactions in Stock are subject to Section 16 of the Exchange Act.

(v) "***Net-Exercise***" means a procedure by which the Participant will be issued a number of shares of Stock upon the exercise of an Option determined in accordance with the following formula:

N = X*((A-B)/A), where

"N" = the number of shares of Stock to be issued to the Participant upon exercise of the Option (rounded down to the nearest whole number);
"X" = the total number of shares with respect to which the Participant has elected to exercise the Option;
"A" = the Fair Market Value of one (1) share of Stock determined on the exercise date; and
"B" = the exercise price per share (as defined in the Participant's Award Agreement)

(w) "***Nonemployee Director***" means a Director who is not an Employee.

(x) "***Nonemployee Director Award***" means an Award granted to a Nonemployee Director.

(y) "***Nonstatutory Stock Option***" means an Option not intended to be (as set forth in the Award Agreement) an incentive stock option within the meaning of Section 422(b) of the Code.

(z) "***Officer***" means any person designated by the Board as an officer of the Company.

(aa) "***Option***" means an Incentive Stock Option or a Nonstatutory Stock Option granted pursuant to the Plan.

(bb) "***Other Stock-Based Award***" means an Award denominated in shares of Stock and granted pursuant to Section 11.

(cc) "***Ownership Change Event***" means the occurrence of any of the following with respect to the Company: (i) the direct or indirect sale or exchange in a single or series of related transactions by the stockholders of the Company of more than fifty percent (50%) of the voting stock of the Company; (ii) a merger or consolidation in which the Company is a party; or (iii) the sale, exchange, or transfer of all or substantially all of the assets of the Company (other than a sale, exchange or transfer to one or more subsidiaries of the Company).

(dd) "***Parent Corporation***" means any present or future "parent corporation" of the Company, as defined in Section 424(e) of the Code.

(ee) "***Participant***" means any eligible person who has been granted one or more Awards.

(ff) "***Participating Company***" means the Company or any Parent Corporation, Subsidiary Corporation or Affiliate.

(gg) "***Participating Company Group***" means, at any point in time, the Company and all other entities collectively which are then Participating Companies.

(hh) "***Performance Award***" means an Award of Performance Shares or Performance Units.

(ii) "***Performance Award Formula***" means, for any Performance Award, a formula or table established by the Committee pursuant to Section 10.3 which provides the basis for computing the value of a Performance Award at one or more threshold levels of attainment of the applicable Performance Goal(s) measured as of the end of the applicable Performance Period.

(jj) "***Performance Goal***" means a performance goal established by the Committee pursuant to Section 10.3.

(kk) "***Performance Period***" means a period established by the Committee pursuant to Section 10.3 at the end of which one or more Performance Goals are to be measured.

(ll) "***Performance Share***" means a right granted to a Participant pursuant to Section 10 to receive a payment equal to the value of a Performance Share, as determined by the Committee, based on performance.

(mm) "***Performance Unit***" means a right granted to a Participant pursuant to Section 10 to receive a payment equal to the value of a Performance Unit, as determined by the Committee, based upon performance.

(nn) "***Restricted Stock Award***" means an Award of a Restricted Stock Bonus or a Restricted Stock Purchase Right.

(oo) "***Restricted Stock Bonus***" means Stock granted to a Participant pursuant to Section 8.

(pp) "***Restricted Stock Purchase Right***" means a right to purchase Stock granted to a Participant pursuant to Section 8.

(qq) "***Restricted Stock Unit***" means a right granted to a Participant pursuant to Section 9 to receive a share of Stock on a date determined in accordance with the provisions of such Sections, as applicable, and the Participant's Award Agreement.

(rr) "***Rule 16b-3***" means Rule 16b-3 under the Exchange Act, as amended from time to time, or any successor rule or regulation.

(ss) "***SAR***" or "***Stock Appreciation Right***" means a right granted to a Participant pursuant to Section 7 to receive payment, for each share of Stock subject to such Award, of an amount equal to the excess, if any, of the Fair Market Value of a share of Stock on the date of exercise of the Award over the exercise price.

(tt) "***Section 409A***" means Section 409A of the Code.

(uu) "***Section 409A Deferred Compensation***" means compensation provided pursuant to an Award that constitutes deferred compensation subject to and not exempted from the requirements of Section 409A.

(vv) "***Securities Act***" means the Securities Act of 1933, as amended.

(ww) "***Service***" means a Participant's employment or service with the Participating Company Group, whether in the capacity of an Employee, a Director or a Consultant. Unless otherwise provided by the Committee, a Participant's Service shall not be deemed to have terminated merely because of a change in the capacity in which the Participant renders such Service or a change in the Participating Company for which the Participant renders such Service, provided that there is no interruption or termination of the Participant's Service. Furthermore, a Participant's Service shall not be deemed to have terminated if the Participant takes any military leave, sick leave, or other bona fide leave of absence approved by the Company. However, unless otherwise provided by the Committee, if any such leave taken by a Participant exceeds ninety (90) days, then on the ninety-first (91st) day following the commencement of such leave the Participant's Service shall be deemed to have terminated, unless the Participant's right to return to Service is guaranteed by statute or contract. Notwithstanding the foregoing, unless otherwise designated by the Company or required by law, an unpaid leave of absence shall not be treated as Service for purposes of determining vesting under the Participant's Award Agreement. A Participant's Service shall be deemed to have

terminated either upon an actual termination of Service or upon the business entity for which the Participant performs Service ceasing to be a Participating Company. Subject to the foregoing, the Company, in its discretion, shall determine whether the Participant's Service has terminated and the effective date of such termination.

(xx) "***Stock***" means the common stock of the Company, as adjusted from time to time in accordance with Section 4.3.

(yy) "***Subsidiary Corporation***" means any present or future "subsidiary corporation" of the Company, as defined in Section 424(f) of the Code.

(zz) "***Ten Percent Owner***" means a Participant who, at the time an Option is granted to the Participant, owns stock possessing more than ten percent (10%) of the total combined voting power of all classes of stock of a Participating Company (other than an Affiliate) within the meaning of Section 422(b)(6) of the Code.

(aaa) "***Trading Compliance Policy***" means the written policy of the Company pertaining to the purchase, sale, transfer or other disposition of the Company's equity securities by Directors, Officers, Employees or other service providers who may possess material, nonpublic information regarding the Company or its securities.

(bbb) "***Vesting Conditions***" mean those conditions established in accordance with the Plan prior to the satisfaction of which shares subject to an Award remain subject to forfeiture or a repurchase option in favor of the Company exercisable for the Participant's monetary purchase price, if any, for such shares upon the Participant's termination of Service.

2.2 **Construction.** Captions and titles contained herein are for convenience only and shall not affect the meaning or interpretation of any provision of the Plan. Except when otherwise indicated by the context, the singular shall include the plural and the plural shall include the singular. Use of the term "or" is not intended to be exclusive, unless the context clearly requires otherwise.

3. ADMINISTRATION.

3.1 **Administration by the Committee.** The Plan shall be administered by the Committee. All questions of interpretation of the Plan, of any Award Agreement or of any other form of agreement or other document employed by the Company in the administration of the Plan or of any Award shall be determined by the Committee, and such determinations shall be final, binding and conclusive upon all persons having an interest in the Plan or such Award, unless fraudulent or made in bad faith. Any and all actions, decisions and determinations taken or made by the Committee in the exercise of its discretion pursuant to the Plan or Award Agreement or other agreement thereunder (other than determining questions of interpretation pursuant to the preceding sentence) shall be final, binding and conclusive upon all persons having an interest therein. All expenses incurred in connection in the administration of the Plan shall be paid by the Company.

3.2 **Authority of Officers.** Any Officer shall have the authority to act on behalf of the Company with respect to any matter, right, obligation, determination or election which is the responsibility of or which is allocated to the Company herein, provided the Officer has apparent authority with respect to such matter, right, obligation, determination or election.

3.3 **Administration with Respect to Insiders.** With respect to participation by Insiders in the Plan, at any time that any class of equity security of the Company is registered pursuant to Section 12 of the Exchange Act, the Plan shall be administered in compliance with the requirements, if any, of Rule 16b-3.

3.4 **Powers of the Committee.** In addition to any other powers set forth in the Plan and subject to the provisions of the Plan, the Committee shall have the full and final power and authority, in its discretion:

(a) to determine the persons to whom, and the time or times at which, Awards shall be granted and the number of shares of Stock, units or monetary value to be subject to each Award;

(b) to determine the type of Award granted;

(c) to determine the Fair Market Value of shares of Stock or other property;

(d) to determine the terms, conditions and restrictions applicable to each Award (which need not be identical) and any shares acquired pursuant thereto, including, without limitation, (i) the exercise or purchase price of shares pursuant to any Award, (ii) the method of payment for shares purchased pursuant to any Award, (iii) the method for satisfaction of any tax withholding obligation arising in connection with any Award, including by the withholding or delivery of shares of Stock, (iv) the timing, terms and conditions of the exercisability or vesting of any Award or any shares acquired pursuant thereto, (v) the Performance Measures, Performance Period, Performance Award Formula and Performance Goals applicable to any Award and the extent to which such Performance Goals have been attained, (vi) the time of the expiration of any Award, (vii) the effect of the Participant's termination of Service on any of the foregoing, and (viii) all other terms, conditions and restrictions applicable to any Award or shares acquired pursuant thereto not inconsistent with the terms of the Plan;

(e) to determine whether an Award will be settled in shares of Stock, cash, or in any combination thereof;

(f) to approve one or more forms of Award Agreement;

(g) to amend, modify, extend, cancel or renew any Award or to waive any restrictions or conditions applicable to any Award or any shares acquired pursuant thereto;

(h) to accelerate, continue, extend or defer the exercisability or vesting of any Award or any shares acquired pursuant thereto, including with respect to the period following a Participant's termination of Service;

(i) to prescribe, amend or rescind rules, guidelines and policies relating to the Plan, or to adopt sub-plans or supplements to, or alternative versions of, the Plan, including, without limitation, as the Committee deems necessary or desirable to comply with the laws or regulations of or to accommodate the tax policy, accounting principles or custom of, foreign jurisdictions whose citizens may be granted Awards; and

(j) to correct any defect, supply any omission or reconcile any inconsistency in the Plan or any Award Agreement and to make all other determinations and take such other actions with respect to the Plan or any Award as the Committee may deem advisable to the extent not inconsistent with the provisions of the Plan or applicable law.

3.5 **Option or SAR Repricing.** Without the affirmative vote of holders of a majority of the shares of Stock cast in person or by proxy at a meeting of the stockholders of the Company at which a quorum representing a majority of all outstanding shares of Stock is present or represented by proxy, the Board shall not approve a program providing for either (a) the cancellation of outstanding Options or SARs having exercise prices per share greater than the then Fair Market Value of a share of Stock ("***Underwater Awards***") and the grant in substitution therefore of new Options or SARs having a lower exercise price, Full Value Awards or payments in cash, or (b) the amendment of outstanding Underwater Awards to reduce the exercise price thereof. This Section shall not be construed to apply to "issuing or assuming a stock option in a transaction to which Section 424(a) applies," within the meaning of Section 424 of the Code or to an adjustment pursuant to Section 4.3.

3.6 **Indemnification.** In addition to such other rights of indemnification as they may have as members of the Board or the Committee or as officers or employees of the Participating Company Group, members of the Board or the Committee and any officers or employees of the Participating Company Group to whom authority to act for the Board, the Committee or the Company is delegated shall be indemnified by the Company against all reasonable expenses, including attorneys' fees, actually and necessarily incurred in connection with the defense of any action, suit or proceeding, or in connection with any appeal therein, to which they or any of them may be a party by reason of any action taken or failure to act under or in connection with the Plan, or any right granted hereunder, and against all amounts paid by them in settlement thereof (provided such settlement is approved by independent legal counsel selected by the Company) or paid by them in satisfaction of a judgment in any such action, suit or proceeding, except in relation to matters as to which it shall be adjudged in such action, suit or proceeding that such person is liable for gross negligence, bad faith or intentional misconduct in duties; provided, however, that within sixty (60) days after the institution of such action, suit or proceeding, such person shall offer to the Company, in writing, the opportunity at its own expense to handle and defend the same.

4. SHARES SUBJECT TO PLAN.

4.1 **Maximum Number of Shares Issuable.** Subject to adjustment as provided in Sections 4.2 and 4.3, the maximum aggregate number of shares of Stock that may be issued under the Plan shall be equal to five million three hundred eighty three thousand two hundred seventy four (5,383,274) and shall consist of authorized but unissued or reacquired shares of Stock or any combination thereof.

4.2 **Share Counting.** If an outstanding Award for any reason expires or is terminated or canceled without having been exercised or settled in full, or if shares of Stock acquired pursuant to an Award subject to forfeiture or repurchase are forfeited or repurchased by the Company for an amount not greater than the Participant's purchase price, the shares of Stock allocable to the terminated portion of such Award or such forfeited or repurchased shares of Stock shall again be available for issuance under the Plan. Shares of Stock shall not be deemed to have been issued pursuant to the Plan with respect to any portion of an Award that is settled in cash. Upon payment in shares of Stock pursuant to the exercise of an SAR, the number of shares available for issuance under the Plan shall be reduced by the gross number of shares for which the SAR is exercised. If the exercise price of an Option is paid by tender to the Company, or attestation to the ownership, of shares of Stock owned by the Participant, or by means of a Net-Exercise, the number of shares available for issuance under the Plan shall be reduced by the gross number of shares for which the Option is exercised. Shares withheld or reacquired by the Company in satisfaction of tax withholding obligations pursuant to Section 16.2 shall not again be available for issuance under the Plan.

4.3 **Adjustments for Changes in Capital Structure.** Subject to any required action by the stockholders of the Company and the requirements of Sections 409A and 424 of the Code to the extent applicable, in the event of any change in the Stock effected without receipt of consideration by the Company, whether through merger, consolidation, reorganization, reincorporation, recapitalization, reclassification, stock dividend, stock split, reverse stock split, split-up, split-off, spin-off, combination of shares, exchange of shares, or similar change in the capital structure of the Company, or in the event of payment of a dividend or distribution to the stockholders of the Company in a form other than Stock (excepting normal cash dividends) that has a material effect on the Fair Market Value of shares of Stock, appropriate and proportionate adjustments shall be made in the number and kind of shares subject to the Plan and to any outstanding Awards, in the Award limits set forth in Section 5.3 and in the exercise or purchase price per share under any outstanding Award in order to prevent dilution or enlargement of Participants' rights under the Plan. For purposes of the foregoing, conversion of any convertible securities of the Company shall not be treated as "effected without receipt of consideration by the Company." If a majority of the shares which are of the same class as the shares that are subject to outstanding Awards are exchanged for, converted into, or otherwise become (whether or not pursuant to an Ownership Change Event) shares of another corporation (the "***New Shares***"), the Committee may unilaterally amend the outstanding Awards to provide that such Awards are for New Shares. In the event of any such amendment, the number of shares subject to, and the exercise or purchase price per share of, the outstanding Awards shall be adjusted in a fair and equitable manner as determined by the Committee, in its discretion. Any fractional share resulting from an adjustment pursuant to this Section shall be rounded down to the nearest whole number, and in no event may the exercise or purchase price under any Award be decreased to an amount less than the par value, if any, of the stock subject to such Award. The Committee in its discretion, may also make such adjustments in the terms of any Award to reflect, or related to, such changes in the capital structure of the Company or distributions as it deems appropriate, including modification of Performance Goals, Performance Award Formulas and Performance Periods. The adjustments determined by the Committee pursuant to this Section shall be final, binding and conclusive.

The Committee may, without affecting the number of shares of Stock reserved or available hereunder, authorize the issuance or assumption of benefits under this Plan in connection with any merger, consolidation, acquisition of property or stock, or reorganization upon such terms and conditions as it may deem appropriate, subject to compliance with Section 409A and any other applicable provisions of the Code.

5. **ELIGIBILITY, PARTICIPATION AND AWARD LIMITATIONS.**

5.1 **Persons Eligible for Awards.** Awards may be granted only to Employees, Consultants and Directors.

5.2 **Participation in the Plan.** Awards are granted solely at the discretion of the Committee. Eligible persons may be granted more than one Award. However, eligibility in accordance with this Section shall not entitle any person to be granted an Award, or, having been granted an Award, to be granted an additional Award.

5.3 **Incentive Stock Option Limitations.**

(a) ***Maximum Number of Shares Issuable Pursuant to Incentive Stock Options.*** Subject to adjustment as provided in Sections 4.2 and 4.3, the maximum aggregate number of shares of Stock that may be issued under the Plan pursuant to the exercise of Incentive Stock Options shall not exceed five million three hundred eighty three thousand two hundred seventy four (5,383,274). The maximum aggregate number of shares of Stock that may be issued under the Plan pursuant to all Awards other than Incentive Stock Options shall be the number of shares determined in accordance with Section 4.1, subject to adjustment as provided in Sections 4.2 and 4.3.

(b) ***Persons Eligible.*** An Incentive Stock Option may be granted only to a person who, on the effective date of grant, is an Employee of the Company, a Parent Corporation or a Subsidiary Corporation (each being an *"**ISO-Qualifying Corporation**"*). Any person who is not an Employee of an ISO-Qualifying Corporation on the effective date of the grant of an Option to such person may be granted only a Nonstatutory Stock Option.

(c) ***Fair Market Value Limitation.*** To the extent that options designated as Incentive Stock Options (granted under all stock option plans of the Participating Company Group, including the Plan) become exercisable by a Participant for the first time during any calendar year for stock having a Fair Market Value greater than One Hundred Thousand Dollars ($100,000), the portion of such options which exceeds such amount shall be treated as Nonstatutory Stock Options. For purposes of this Section, options designated as Incentive Stock Options shall be taken into account in the order in which they were granted, and the Fair Market Value of stock shall be determined as of the time the option with respect to such stock is granted. If the Code is amended to provide for a limitation different from that set forth in this Section, such different limitation shall be deemed incorporated herein effective as of the date and with respect to such Options as required or permitted by such amendment to the Code. If an Option is treated as an Incentive Stock Option in part and as a Nonstatutory Stock Option in part by reason of the limitation set forth in this Section, the Participant may designate which portion of such Option the Participant is exercising. In the absence of such designation, the Participant shall be deemed to have exercised the Incentive Stock Option portion of the Option first. Upon exercise, shares issued pursuant to each such portion shall be separately identified.

6. **STOCK OPTIONS.**

Options shall be evidenced by Award Agreements specifying the number of shares of Stock covered thereby, in such form as the Committee shall from time to time establish. Award Agreements evidencing Options may incorporate all or any of the terms of the Plan by reference and shall comply with and be subject to the following terms and conditions:

6.1 **Exercise Price.** The exercise price for each Option shall be established in the discretion of the Committee; provided, however, that (a) the exercise price per share shall be not less than the Fair Market Value of a share of Stock on the effective date of grant of the Option and (b) no Incentive Stock Option granted to a Ten Percent Owner shall have an exercise price per share less than one hundred ten percent (110%) of the Fair Market Value of a share of Stock on the effective date of grant of the Option. Notwithstanding the foregoing, an Option (whether an Incentive Stock Option or a Nonstatutory Stock Option) may be granted with an exercise price lower than the minimum exercise price set forth above if such Option is granted pursuant to an assumption or substitution for another option in a manner qualifying under the provisions of Section 424(a) of the Code.

6.2 **Exercisability and Term of Options.** Options shall be exercisable at such time or times, or upon such event or events, and subject to such terms, conditions, performance criteria and restrictions as shall be determined by the Committee and set forth in the Award Agreement evidencing such Option; provided, however, that (a) no Option shall be exercisable after the expiration of ten (10) years after the effective date of grant of such Option and (b) no Incentive Stock Option granted to a Ten Percent Owner shall be exercisable after the expiration of five (5) years after the effective date of grant of such Option. Subject to the foregoing, unless otherwise specified by the Committee in the grant of an Option, each Option shall terminate ten (10) years after the effective date of grant of the Option, unless earlier terminated in accordance with its provisions.

6.3 **Payment of Exercise Price.**

(a) ***Forms of Consideration Authorized.*** Except as otherwise provided below, payment of the exercise price for the number of shares of Stock being purchased pursuant to any Option shall be made (i) in cash, by check or in cash equivalent, (ii) by tender to the Company, or attestation to the ownership, of shares of Stock owned by the Participant having a Fair Market Value not less than the exercise price, (iii) by delivery of a properly executed notice of exercise together with irrevocable instructions to a broker providing for the assignment to the Company of the proceeds of a sale or loan with respect to some or all of the shares being acquired upon the exercise of the Option (including, without limitation, through an exercise complying with the provisions of Regulation T as promulgated from time to time by the Board of Governors of the Federal Reserve System) (a *"**Cashless Exercise**"*), (iv) by delivery of a properly executed notice electing a Net-Exercise, (v) by such other consideration as may be approved by the Committee from time to time to the extent permitted by applicable law, or (vi) by any combination thereof. The Committee may at any time or from time to time grant Options which do not permit all of the foregoing forms of consideration to be used in payment of the exercise price or which otherwise restrict one or more forms of consideration.

(b) ***Limitations on Forms of Consideration.***

(i) **Tender of Stock.** Notwithstanding the foregoing, an Option may not be exercised by tender to the Company, or attestation to the ownership, of shares of Stock to the extent such tender or attestation would constitute a violation of the provisions of any law, regulation or agreement restricting the redemption of the Company's stock. Unless otherwise provided by the Committee, an Option may not be exercised by tender to the Company, or attestation to the ownership, of shares of Stock unless such shares either have been owned by the Participant for such period of time, if any, as the Company may require (and not used for another Option exercise by attestation during such period) or were not acquired, directly or indirectly, from the Company.

(ii) **Cashless Exercise.** The Company reserves, at any and all times, the right, in the Company's sole and absolute discretion, to establish, decline to approve or terminate any program or procedures for the exercise of Options by means of a Cashless Exercise, including with respect to one or more Participants specified by the Company notwithstanding that such program or procedures may be available to other Participants.

6.4 **Effect of Termination of Service.**

(a) ***Option Exercisability.*** Subject to earlier termination of the Option as otherwise provided herein and unless otherwise provided by the Committee, an Option shall terminate immediately upon the Participant's termination of Service to the extent that it is then unvested and shall be exercisable after the Participant's termination of Service to the extent it is then vested only during the applicable time period determined in accordance with this Section and thereafter shall terminate.

(i) **Disability.** If the Participant's Service terminates because of the Disability of the Participant, the Option, to the extent unexercised and exercisable for vested shares on the date on which the Participant's Service terminated, may be exercised by the Participant (or the Participant's guardian or legal representative) at any time prior to the expiration of twelve (12) months after the date on which the Participant's Service terminated, but in any event no later than the date of expiration of the Option's term as set forth in the Award Agreement evidencing such Option (the *"**Option Expiration Date**"*).

(ii) **Death.** If the Participant's Service terminates because of the death of the Participant, the Option, to the extent unexercised and exercisable for vested shares on the date on which the Participant's Service terminated, may be exercised by the Participant's legal representative or other person who acquired the right to exercise the Option by reason of the Participant's death at any time prior to the expiration of twelve (12) months after the date on which the Participant's Service terminated, but in any event no later than the Option Expiration Date. The Participant's Service shall be deemed to have terminated on account of death if the Participant dies within three (3) months after the Participant's termination of Service.

(iii) **Termination for Cause.** Notwithstanding any other provision of the Plan to the contrary, if the Participant's Service is terminated for Cause or if, following the Participant's termination of Service and during any period in which the Option otherwise would remain exercisable, the Participant engages in any act that would constitute Cause, the Option shall terminate in its entirety and cease to be exercisable immediately upon such termination of Service or act.

(iv) **Other Termination of Service.** If the Participant's Service terminates for any reason, except Disability, death or Cause, the Option, to the extent unexercised and exercisable for vested shares on the date on which the Participant's Service terminated, may be exercised by the Participant at any time prior to the expiration of three (3) months after the date on which the Participant's Service terminated, but in any event no later than the Option Expiration Date.

(b) ***Extension if Exercise Prevented by Law.*** Notwithstanding the foregoing, other than termination of Service for Cause, if the exercise of an Option within the applicable time periods set forth in Section 6.4(a) is prevented by the provisions of Section 14 below, the Option shall remain exercisable until the later of (i) thirty (30) days after the date such exercise first would no longer be prevented by such provisions or (ii) the end of the applicable time period under Section 6.4(a), but in any event no later than the Option Expiration Date.

6.5 **Transferability of Options.** During the lifetime of the Participant, an Option shall be exercisable only by the Participant or the Participant's guardian or legal representative. An Option shall not be subject in any manner to anticipation, alienation, sale, exchange, transfer, assignment, pledge, encumbrance, or garnishment by creditors of the Participant or the Participant's beneficiary, except transfer by will or by the laws of descent and distribution. Notwithstanding the foregoing, to the extent permitted by the Committee, in its discretion, and set forth in the Award Agreement evidencing such Option, an Option shall be assignable or transferable subject to the applicable limitations, if any, described in the General Instructions to Form S-8 under the Securities Act or, in the case of an Incentive Stock Option, only as permitted by applicable regulations under Section 421 of the Code in a manner that does not disqualify such Option as an Incentive Stock Option.

7. STOCK APPRECIATION RIGHTS.

Stock Appreciation Rights shall be evidenced by Award Agreements specifying the number of shares of Stock subject to the Award, in such form as the Committee shall from time to time establish. Award Agreements evidencing SARs may incorporate all or any of the terms of the Plan by reference and shall comply with and be subject to the following terms and conditions:

7.1 **Types of SARs Authorized.** SARs may be granted in tandem with all or any portion of a related Option (a "***Tandem SAR***") or may be granted independently of any Option (a "***Freestanding SAR***"). A Tandem SAR may only be granted concurrently with the grant of the related Option.

7.2 **Exercise Price.** The exercise price for each SAR shall be established in the discretion of the Committee; provided, however, that (a) the exercise price per share subject to a Tandem SAR shall be the exercise price per share under the related Option and (b) the exercise price per share subject to a Freestanding SAR shall be not less than the Fair Market Value of a share of Stock on the effective date of grant of the SAR.

7.3 **Exercisability and Term of SARs.**

(a) ***Tandem SARs.*** Tandem SARs shall be exercisable only at the time and to the extent, and only to the extent, that the related Option is exercisable, subject to such provisions as the Committee may specify where the Tandem SAR is granted with respect to less than the full number of shares of Stock subject to the related Option. The Committee may, in its discretion, provide in any Award Agreement evidencing a Tandem SAR that such SAR may not be exercised without the advance approval of the Company and, if such approval is not given, then the Option shall nevertheless remain exercisable in accordance with its terms. A Tandem SAR shall terminate and cease to be exercisable no later than the date on which the related Option expires or is terminated or canceled. Upon the exercise of a Tandem SAR with respect to some or all of the shares subject to such SAR, the related Option shall be canceled automatically as to the number of shares with respect to which the Tandem SAR was exercised. Upon the exercise of an Option related to a Tandem SAR as to some or all of the shares subject to such Option, the related Tandem SAR shall be canceled automatically as to the number of shares with respect to which the related Option was exercised.

(b) ***Freestanding SARs.*** Freestanding SARs shall be exercisable at such time or times, or upon such event or events, and subject to such terms, conditions, performance criteria and restrictions as shall be determined by the Committee and set forth in the Award Agreement evidencing such SAR; provided, however, that no Freestanding SAR shall be exercisable after the expiration of ten (10) years after the effective date of grant of such SAR.

7.4 **Exercise of SARs.** Upon the exercise (or deemed exercise pursuant to Section 7.5) of an SAR, the Participant (or the Participant's legal representative or other person who acquired the right to exercise the SAR by reason of the Participant's death) shall be entitled to receive payment of an amount for each share with respect to which the SAR is exercised equal to the excess, if any, of the Fair Market Value of a share of Stock on the date of exercise of the SAR over the exercise price. Payment of such amount shall be made (a) in the case of a Tandem SAR, solely in shares of Stock in a lump sum upon the date of exercise of the SAR and (b) in the case of a Freestanding SAR, in cash, shares of Stock, or any combination thereof as determined by the Committee, in a lump sum upon the date of exercise of the SAR. When payment is to be made in shares of Stock, the number of shares to be issued shall be determined on the basis of the Fair Market Value of a share of Stock on the date of exercise of the SAR. For purposes of Section 7, an SAR shall be deemed exercised on the date on which the Company receives notice of exercise from the Participant or as otherwise provided in Section 7.5.

7.5 **Deemed Exercise of SARs.** If, on the date on which an SAR would otherwise terminate or expire, the SAR by its terms remains exercisable immediately prior to such termination or expiration and, if so exercised, would result in a payment to the holder of such SAR, then any portion of such SAR which has not previously been exercised shall automatically be deemed to be exercised as of such date with respect to such portion.

7.6 **Effect of Termination of Service.** Subject to earlier termination of the SAR as otherwise provided herein and unless otherwise provided by the Committee, an SAR shall be exercisable after a Participant's termination of Service only to the extent and during the applicable time period determined in accordance with Section 6.4 (treating the SAR as if it were an Option) and thereafter shall terminate.

7.7 **Transferability of SARs.** During the lifetime of the Participant, an SAR shall be exercisable only by the Participant or the Participant's guardian or legal representative. An SAR shall not be subject in any manner to anticipation, alienation, sale, exchange, transfer, assignment, pledge, encumbrance, or garnishment by creditors of the Participant or the Participant's beneficiary, except transfer by will or by the laws of descent and distribution. Notwithstanding the foregoing, to the extent permitted by the Committee, in its discretion, and set forth in the Award Agreement evidencing such Award, a Tandem SAR related to a Nonstatutory Stock Option or a Freestanding SAR shall be assignable or transferable subject to the applicable limitations, if any, described in the General Instructions to Form S-8 under the Securities Act.

8. **RESTRICTED STOCK AWARDS.**

Restricted Stock Awards shall be evidenced by Award Agreements specifying whether the Award is a Restricted Stock Bonus or a Restricted Stock Purchase Right and the number of shares of Stock subject to the Award, in such form as the Committee shall from time to time establish. Award Agreements evidencing Restricted Stock Awards may incorporate all or any of the terms of the Plan by reference and shall comply with and be subject to the following terms and conditions:

8.1 **Types of Restricted Stock Awards Authorized.** Restricted Stock Awards may be granted in the form of either a Restricted Stock Bonus or a Restricted Stock Purchase Right. Restricted Stock Awards may be granted upon such conditions as the Committee shall determine, including, without limitation, upon the attainment of one or more Performance Goals described in Section 10.4. If either the grant of or satisfaction of Vesting Conditions applicable to a Restricted Stock Award is to be contingent upon the attainment of one or more Performance Goals, the Committee shall follow procedures substantially equivalent to those set forth in Sections 10.3 through 10.5(a).

8.2 **Purchase Price.** The purchase price for shares of Stock issuable under each Restricted Stock Purchase Right shall be established by the Committee in its discretion. No monetary payment (other than applicable tax withholding) shall be required as a condition of receiving shares of Stock pursuant to a Restricted Stock Bonus, the consideration for which shall be services actually rendered to a Participating Company or for its benefit. Notwithstanding the foregoing, if required by applicable state corporate law, the Participant shall furnish consideration in the form of cash or past services rendered to a Participating Company or for its benefit having a value not less than the par value of the shares of Stock subject to a Restricted Stock Award.

8.3 **Purchase Period.** A Restricted Stock Purchase Right shall be exercisable within a period established by the Committee, which shall in no event exceed thirty (30) days from the effective date of the grant of the Restricted Stock Purchase Right.

8.4 **Payment of Purchase Price.** Except as otherwise provided below, payment of the purchase price for the number of shares of Stock being purchased pursuant to any Restricted Stock Purchase Right shall be made (a) in cash, by check or in cash equivalent, (b) by such other consideration as may be approved by the Committee from time to time to the extent permitted by applicable law, or (c) by any combination thereof.

8.5 **Vesting and Restrictions on Transfer.** Shares issued pursuant to any Restricted Stock Award may (but need not) be made subject to Vesting Conditions based upon the satisfaction of such Service requirements, conditions, restrictions or performance criteria, including, without limitation, Performance Goals as described in Section 10.4, as shall be established by the Committee and set forth in the Award Agreement evidencing such Award. During any period in which shares acquired pursuant to a Restricted Stock Award remain subject to Vesting Conditions, such shares may not be sold, exchanged, transferred, pledged, assigned or otherwise disposed of other than pursuant to an Ownership Change Event or as provided in Section 8.8. The Committee, in its discretion, may provide in any Award Agreement evidencing a Restricted Stock Award that, if the satisfaction of Vesting Conditions with respect to any shares subject to such Restricted Stock Award would otherwise occur on a day on which the sale of such shares would violate the provisions of the Trading Compliance Policy, then satisfaction of the Vesting Conditions automatically shall be determined on the next trading day on which the sale of such shares would not violate the Trading Compliance Policy. Upon request by the Company, each Participant shall execute any agreement evidencing such transfer restrictions prior to the receipt of shares of Stock hereunder and shall promptly present to the Company any and all certificates representing shares of Stock acquired hereunder for the placement on such certificates of appropriate legends evidencing any such transfer restrictions.

8.6 **Voting Rights; Dividends and Distributions.** Except as provided in this Section, Section 8.5 and any Award Agreement, during any period in which shares acquired pursuant to a Restricted Stock Award remain subject to Vesting Conditions, the Participant shall have all of the rights of a stockholder of the Company holding shares of Stock, including the right to vote such shares and to receive all dividends and other distributions paid with respect to such shares; provided, however, that if so determined by the Committee and provided by the Award Agreement, such dividends and distributions shall be subject to the same Vesting Conditions as the shares subject to the Restricted Stock Award with respect to which such dividends or distributions were paid. In the event of a dividend or distribution paid in shares of Stock or other property or any other adjustment made upon a change in the capital structure of the Company as described in Section 4.3, any and all new, substituted or additional securities or other property (other than normal cash dividends) to which the Participant is entitled by reason of the Participant's Restricted Stock Award shall be immediately subject to the same Vesting Conditions as the shares subject to the Restricted Stock Award with respect to which such dividends or distributions were paid or adjustments were made.

8.7 **Effect of Termination of Service.** Unless otherwise provided by the Committee in the Award Agreement evidencing a Restricted Stock Award, if a Participant's

Service terminates for any reason, whether voluntary or involuntary (including the Participant's death or disability), then (a) the Company shall have the option to repurchase for the purchase price paid by the Participant any shares acquired by the Participant pursuant to a Restricted Stock Purchase Right which remain subject to Vesting Conditions as of the date of the Participant's termination of Service and (b) the Participant shall forfeit to the Company any shares acquired by the Participant pursuant to a Restricted Stock Bonus which remain subject to Vesting Conditions as of the date of the Participant's termination of Service. The Company shall have the right to assign at any time any repurchase right it may have, whether or not such right is then exercisable, to one or more persons as may be selected by the Company.

8.8 **Nontransferability of Restricted Stock Award Rights.** Rights to acquire shares of Stock pursuant to a Restricted Stock Award shall not be subject in any manner to anticipation, alienation, sale, exchange, transfer, assignment, pledge, encumbrance or garnishment by creditors of the Participant or the Participant's beneficiary, except transfer by will or the laws of descent and distribution. All rights with respect to a Restricted Stock Award granted to a Participant hereunder shall be exercisable during his or her lifetime only by such Participant or the Participant's guardian or legal representative.

9. **RESTRICTED STOCK UNIT AWARDS.**

Restricted Stock Unit Awards shall be evidenced by Award Agreements specifying the number of Restricted Stock Units subject to the Award, in such form as the Committee shall from time to time establish. Award Agreements evidencing Restricted Stock Units may incorporate all or any of the terms of the Plan by reference and shall comply with and be subject to the following terms and conditions:

9.1 **Grant of Restricted Stock Unit Awards.** Restricted Stock Unit Awards may be granted upon such conditions as the Committee shall determine, including, without limitation, upon the attainment of one or more Performance Goals described in Section 10.4. If either the grant of a Restricted Stock Unit Award or the Vesting Conditions with respect to such Award is to be contingent upon the attainment of one or more Performance Goals, the Committee shall follow procedures substantially equivalent to those set forth in Sections 10.3 through 10.5(a).

9.2 **Purchase Price.** No monetary payment (other than applicable tax withholding, if any) shall be required as a condition of receiving a Restricted Stock Unit Award, the consideration for which shall be services actually rendered to a Participating Company or for its benefit. Notwithstanding the foregoing, if required by applicable state corporate law, the Participant shall furnish consideration in the form of cash or past services rendered to a Participating Company or for its benefit having a value not less than the par value of the shares of Stock issued upon settlement of the Restricted Stock Unit Award.

9.3 **Vesting.** Restricted Stock Unit Awards may (but need not) be made subject to Vesting Conditions based upon the satisfaction of such Service requirements, conditions, restrictions or performance criteria, including, without limitation, Performance Goals as described in Section 10.4, as shall be established by the Committee and set forth in the Award Agreement evidencing such Award. The Committee, in its discretion, may provide in any

Award Agreement evidencing a Restricted Stock Unit Award that, if the satisfaction of Vesting Conditions with respect to any shares subject to the Award would otherwise occur on a day on which the sale of such shares would violate the provisions of the Trading Compliance Policy, then the satisfaction of the Vesting Conditions automatically shall be determined on the first to occur of (a) the next trading day on which the sale of such shares would not violate the Trading Compliance Policy or (b) the later of (i) last day of the calendar year in which the original vesting date occurred or (ii) the last day of the Company's taxable year in which the original vesting date occurred.

9.4 **Voting Rights, Dividend Equivalent Rights and Distributions.** Participants shall have no voting rights with respect to shares of Stock represented by Restricted Stock Units until the date of the issuance of such shares (as evidenced by the appropriate entry on the books of the Company or of a duly authorized transfer agent of the Company). However, the Committee, in its discretion, may provide in the Award Agreement evidencing any Restricted Stock Unit Award that the Participant shall be entitled to Dividend Equivalent Rights with respect to the payment of cash dividends on Stock during the period beginning on the date such Award is granted and ending, with respect to each share subject to the Award, on the earlier of the date the Award is settled or the date on which it is terminated. Such Dividend Equivalent Rights, if any, shall be paid by crediting the Participant with additional whole Restricted Stock Units as of the date of payment of such cash dividends on Stock. The number of additional Restricted Stock Units (rounded to the nearest whole number) to be so credited shall be determined by dividing (a) the amount of cash dividends paid on such date with respect to the number of shares of Stock represented by the Restricted Stock Units previously credited to the Participant by (b) the Fair Market Value per share of Stock on such date. Such additional Restricted Stock Units shall be subject to the same terms and conditions and shall be settled in the same manner and at the same time as the Restricted Stock Units originally subject to the Restricted Stock Unit Award. In the event of a dividend or distribution paid in shares of Stock or other property or any other adjustment made upon a change in the capital structure of the Company as described in Section 4.3, appropriate adjustments shall be made in the Participant's Restricted Stock Unit Award so that it represents the right to receive upon settlement any and all new, substituted or additional securities or other property (other than normal cash dividends) to which the Participant would be entitled by reason of the shares of Stock issuable upon settlement of the Award, and all such new, substituted or additional securities or other property shall be immediately subject to the same Vesting Conditions as are applicable to the Award.

9.5 **Effect of Termination of Service.** Unless otherwise provided by the Committee and set forth in the Award Agreement evidencing a Restricted Stock Unit Award, if a Participant's Service terminates for any reason, whether voluntary or involuntary (including the Participant's death or disability), then the Participant shall forfeit to the Company any Restricted Stock Units pursuant to the Award which remain subject to Vesting Conditions as of the date of the Participant's termination of Service.

9.6 **Settlement of Restricted Stock Unit Awards.** The Company shall issue to a Participant on the date on which Restricted Stock Units subject to the Participant's Restricted Stock Unit Award vest or on such other date determined by the Committee, in its discretion, and set forth in the Award Agreement one (1) share of Stock (and/or any other new, substituted or additional securities or other property pursuant to an adjustment described in

Section 9.4) for each Restricted Stock Unit then becoming vested or otherwise to be settled on such date, subject to the withholding of applicable taxes, if any. If permitted by the Committee, the Participant may elect, consistent with the requirements of Section 409A, to defer receipt of all or any portion of the shares of Stock or other property otherwise issuable to the Participant pursuant to this Section, and such deferred issuance date(s) and amount(s) elected by the Participant shall be set forth in the Award Agreement. Notwithstanding the foregoing, the Committee, in its discretion, may provide for settlement of any Restricted Stock Unit Award by payment to the Participant in cash of an amount equal to the Fair Market Value on the payment date of the shares of Stock or other property otherwise issuable to the Participant pursuant to this Section.

9.7 **Nontransferability of Restricted Stock Unit Awards.** The right to receive shares pursuant to a Restricted Stock Unit Award shall not be subject in any manner to anticipation, alienation, sale, exchange, transfer, assignment, pledge, encumbrance, or garnishment by creditors of the Participant or the Participant's beneficiary, except transfer by will or by the laws of descent and distribution. All rights with respect to a Restricted Stock Unit Award granted to a Participant hereunder shall be exercisable during his or her lifetime only by such Participant or the Participant's guardian or legal representative.

10. PERFORMANCE AWARDS.

Performance Awards shall be evidenced by Award Agreements in such form as the Committee shall from time to time establish. Award Agreements evidencing Performance Awards may incorporate all or any of the terms of the Plan by reference and shall comply with and be subject to the following terms and conditions:

10.1 **Types of Performance Awards Authorized.** Performance Awards may be granted in the form of either Performance Shares or Performance Units. Each Award Agreement evidencing a Performance Award shall specify the number of Performance Shares or Performance Units subject thereto, the Performance Award Formula, the Performance Goal(s) and Performance Period applicable to the Award, and the other terms, conditions and restrictions of the Award.

10.2 **Initial Value of Performance Shares and Performance Units.** Unless otherwise provided by the Committee in granting a Performance Award, each Performance Share shall have an initial monetary value equal to the Fair Market Value of one (1) share of Stock, subject to adjustment as provided in Section 4.3, on the effective date of grant of the Performance Share, and each Performance Unit shall have an initial monetary value established by the Committee at the time of grant. The final value payable to the Participant in settlement of a Performance Award determined on the basis of the applicable Performance Award Formula will depend on the extent to which Performance Goals established by the Committee are attained within the applicable Performance Period established by the Committee.

10.3 **Establishment of Performance Period, Performance Goals and Performance Award Formula.** In granting each Performance Award, the Committee shall establish in writing the applicable Performance Period, Performance Award Formula and one or more Performance Goals which, when measured at the end of the Performance Period, shall

determine on the basis of the Performance Award Formula the final value of the Performance Award to be paid to the Participant. The Committee shall establish the Performance Goal(s) and Performance Award Formula applicable to each Performance Award no later than the earlier of (a) the date ninety (90) days after the commencement of the applicable Performance Period or (b) the date on which 25% of the Performance Period has elapsed, and, in any event, at a time when the outcome of the Performance Goals remains substantially uncertain. Once established, the Performance Goals and Performance Award Formula applicable to a Covered Employee shall not be changed during the Performance Period. The Company shall notify each Participant granted a Performance Award of the terms of such Award, including the Performance Period, Performance Goal(s) and Performance Award Formula.

10.4 **Measurement of Performance Goals.** Performance Goals shall be established by the Committee on the basis of targets to be attained ("***Performance Targets***") with respect to one or more measures of business or financial performance (each, a "***Performance Measure***"), subject to the following:

(a) ***Performance Measures.*** Performance Measures shall have the same meanings as used in the Company's financial statements, or, if such terms are not used in the Company's financial statements, they shall have the meaning applied pursuant to generally accepted accounting principles, or as used generally in the Company's industry. Performance Measures shall be calculated with respect to the Company and each Subsidiary Corporation consolidated therewith for financial reporting purposes or such division or other business unit as may be selected by the Committee. For purposes of the Plan, the Performance Measures applicable to a Performance Award shall be calculated in accordance with generally accepted accounting principles, if applicable, but prior to the accrual or payment of any Performance Award for the same Performance Period and excluding the effect (whether positive or negative) of any change in accounting standards or any extraordinary, unusual or nonrecurring item, as determined by the Committee, occurring after the establishment of the Performance Goals applicable to the Performance Award. Each such adjustment, if any, shall be made solely for the purpose of providing a consistent basis from period to period for the calculation of Performance Measures in order to prevent the dilution or enlargement of the Participant's rights with respect to a Performance Award. Performance Measures may be one or more of the following, as determined by the Committee:

(i) revenue;

(ii) sales;

(iii) expenses;

(iv) operating income;

(v) gross margin;

(vi) operating margin;

(vii) earnings before any one or more of: stock-based compensation expense, interest, taxes, depreciation and amortization;

(viii) pre-tax profit;

(ix) net operating income;

(x) net income;

(xi) economic value added;

(xii) free cash flow;

(xiii) operating cash flow;

(xiv) balance of cash, cash equivalents and marketable securities;

(xv) stock price;

(xvi) earnings per share;

(xvii) return on stockholder equity;

(xviii) return on capital;

(xix) return on assets;

(xx) return on investment;

(xxi) employee satisfaction;

(xxii) employee retention;

(xxiii) market share;

(xxiv) customer satisfaction;

(xxv) product development;

(xxvi) research and development expenses;

(xxvii) completion of an identified special project; and

(xxviii) completion of a joint venture or other corporate transaction.

(b) ***Performance Targets.*** Performance Targets may include a minimum, maximum, target level and intermediate levels of performance, with the final value of a Performance Award determined under the applicable Performance Award Formula by the level attained during the applicable Performance Period. A Performance Target may be stated as an absolute value or as a value determined relative to an index, budget or other standard selected by the Committee.

10.5 **Settlement of Performance Awards.**

(a) ***Determination of Final Value.*** As soon as practicable following the completion of the Performance Period applicable to a Performance Award, the Committee shall certify in writing the extent to which the applicable Performance Goals have been attained and the resulting final value of the Award earned by the Participant and to be paid upon its settlement in accordance with the applicable Performance Award Formula.

(b) ***Discretionary Adjustment of Award Formula.*** In its discretion, the Committee may, either at the time it grants a Performance Award or at any time thereafter, provide for the positive or negative adjustment of the Performance Award Formula applicable to a Performance Award granted to any Participant who is not a Covered Employee to reflect such Participant's individual performance in his or her position with the Company or such other factors as the Committee may determine. If permitted under a Covered Employee's Award Agreement, the Committee shall have the discretion, on the basis of such criteria as may be established by the Committee, to reduce some or all of the value of the Performance Award that would otherwise be paid to the Covered Employee upon its settlement notwithstanding the attainment of any Performance Goal and the resulting value of the Performance Award determined in accordance with the Performance Award Formula.

(c) ***Effect of Leaves of Absence.*** Unless otherwise required by law or a Participant's Award Agreement, payment of the final value, if any, of a Performance Award held by a Participant who has taken in excess of thirty (30) days in unpaid leaves of absence during a Performance Period shall be prorated on the basis of the number of days of the Participant's Service during the Performance Period during which the Participant was not on an unpaid leave of absence.

(d) ***Notice to Participants.*** As soon as practicable following the Committee's determination and certification in accordance with Sections 10.5(a) and (b), the Company shall notify each Participant of the determination of the Committee.

(e) ***Payment in Settlement of Performance Awards.*** As soon as practicable following the Committee's determination and certification in accordance with Sections 10.5(a) and (b), but in any event within the Short-Term Deferral Period described in Section 15.1 (except as otherwise provided below or consistent with the requirements of Section 409A), payment shall be made to each eligible Participant (or such Participant's legal representative or other person who acquired the right to receive such payment by reason of the Participant's death) of the final value of the Participant's Performance Award. Payment of such amount shall be made in cash, shares of Stock, or a combination thereof as determined by the Committee. Unless otherwise provided in the Award Agreement evidencing a Performance Award, payment shall be made in a lump sum. If permitted by the Committee, the Participant may elect, consistent with the requirements of Section 409A, to defer receipt of all or any portion of the payment to be made to Participant pursuant to this Section, and such deferred payment date(s) elected by the Participant shall be set forth in the Award Agreement. If any payment is to be made on a deferred basis, the Committee may, but shall not be obligated to, provide for the payment during the deferral period of Dividend Equivalent Rights or interest.

(f) ***Provisions Applicable to Payment in Shares.*** If payment is to be made in shares of Stock, the number of such shares shall be determined by dividing the final value of the Performance Award by the Fair Market Value of a share of Stock determined by the method specified in the Award Agreement. Shares of Stock issued in payment of any Performance Award may be fully vested and freely transferable shares or may be shares of Stock subject to Vesting Conditions as provided in Section 8.5. Any shares subject to Vesting Conditions shall be evidenced by an appropriate Award Agreement and shall be subject to the provisions of Sections 8.5 through 8.8 above.

10.6 **Voting Rights; Dividend Equivalent Rights and Distributions.** Participants shall have no voting rights with respect to shares of Stock represented by Performance Share Awards until the date of the issuance of such shares, if any (as evidenced by the appropriate entry on the books of the Company or of a duly authorized transfer agent of the Company). However, the Committee, in its discretion, may provide in the Award Agreement evidencing any Performance Share Award that the Participant shall be entitled to Dividend Equivalent Rights with respect to the payment of cash dividends on Stock during the period beginning on the date the Award is granted and ending, with respect to each share subject to the Award, on the earlier of the date on which the Performance Shares are settled or the date on which they are forfeited. Such Dividend Equivalent Rights, if any, shall be credited to the Participant in the form of additional whole Performance Shares as of the date of payment of such cash dividends on Stock. The number of additional Performance Shares (rounded to the nearest whole number) to be so credited shall be determined by dividing (a) the amount of cash dividends paid on the dividend payment date with respect to the number of shares of Stock represented by the Performance Shares previously credited to the Participant by (b) the Fair Market Value per share of Stock on such date. Dividend Equivalent Rights may be paid currently or may be accumulated and paid to the extent that Performance Shares become nonforfeitable, as determined by the Committee. Settlement of Dividend Equivalent Rights may be made in cash, shares of Stock, or a combination thereof as determined by the Committee, and may be paid on the same basis as settlement of the related Performance Share as provided in Section 10.5. Dividend Equivalent Rights shall not be paid with respect to Performance Units. In the event of a dividend or distribution paid in shares of Stock or other property or any other adjustment made upon a change in the capital structure of the Company as described in Section 4.3, appropriate adjustments shall be made in the Participant's Performance Share Award so that it represents the right to receive upon settlement any and all new, substituted or additional securities or other property (other than normal cash dividends) to which the Participant would be entitled by reason of the shares of Stock issuable upon settlement of the Performance Share Award, and all such new, substituted or additional securities or other property shall be immediately subject to the same Performance Goals as are applicable to the Award.

10.7 **Effect of Termination of Service.** Unless otherwise provided by the Committee and set forth in the Award Agreement evidencing a Performance Award, the effect of a Participant's termination of Service on the Performance Award shall be as follows:

(a) ***Death or Disability.*** If the Participant's Service terminates because of the death or Disability of the Participant before the completion of the Performance Period applicable to the Performance Award, the final value of the Participant's Performance Award shall be determined by the extent to which the applicable Performance Goals have been

attained with respect to the entire Performance Period and shall be prorated based on the number of months of the Participant's Service during the Performance Period. Payment shall be made following the end of the Performance Period in any manner permitted by Section 10.5.

(b) ***Other Termination of Service.*** If the Participant's Service terminates for any reason except death or Disability before the completion of the Performance Period applicable to the Performance Award, such Award shall be forfeited in its entirety; provided, however, that in the event of an involuntary termination of the Participant's Service, the Committee, in its discretion, may waive the automatic forfeiture of all or any portion of any such Award and determine the final value of the Performance Award in the manner provided by Section 10.7(a). Payment of any amount pursuant to this Section shall be made following the end of the Performance Period in any manner permitted by Section 10.5.

10.8 **Nontransferability of Performance Awards.** Prior to settlement in accordance with the provisions of the Plan, no Performance Award shall be subject in any manner to anticipation, alienation, sale, exchange, transfer, assignment, pledge, encumbrance, or garnishment by creditors of the Participant or the Participant's beneficiary, except transfer by will or by the laws of descent and distribution. All rights with respect to a Performance Award granted to a Participant hereunder shall be exercisable during his or her lifetime only by such Participant or the Participant's guardian or legal representative.

11. CASH-BASED AWARDS AND OTHER STOCK-BASED AWARDS.

Cash-Based Awards and Other Stock-Based Awards shall be evidenced by Award Agreements in such form as the Committee shall from time to time establish. Award Agreements evidencing Cash-Based Awards and Other Stock-Based Awards may incorporate all or any of the terms of the Plan by reference and shall comply with and be subject to the following terms and conditions:

11.1 **Grant of Cash-Based Awards**. Subject to the provisions of the Plan, the Committee, at any time and from time to time, may grant Cash-Based Awards to Participants in such amounts and upon such terms and conditions, including the achievement of performance criteria, as the Committee may determine.

11.2 **Grant of Other Stock-Based Awards**. The Committee may grant other types of equity-based or equity-related Awards not otherwise described by the terms of this Plan (including the grant or offer for sale of unrestricted securities, stock-equivalent units, stock appreciation units, securities or debentures convertible into common stock or other forms determined by the Committee) in such amounts and subject to such terms and conditions as the Committee shall determine. Such Awards may involve the transfer of actual shares of Stock to Participants, or payment in cash or otherwise of amounts based on the value of Stock and may include, without limitation, Awards designed to comply with or take advantage of the applicable local laws of jurisdictions other than the United States.

11.3 **Value of Cash-Based and Other Stock-Based Awards**. Each Cash-Based Award shall specify a monetary payment amount or payment range as determined by the Committee. Each Other Stock-Based Award shall be expressed in terms of shares of Stock or

units based on such shares of Stock, as determined by the Committee. The Committee may require the satisfaction of such Service requirements, conditions, restrictions or performance criteria, including, without limitation, Performance Goals as described in Section 10.4, as shall be established by the Committee and set forth in the Award Agreement evidencing such Award. If the Committee exercises its discretion to establish performance criteria, the final value of Cash-Based Awards or Other Stock-Based Awards that will be paid to the Participant will depend on the extent to which the performance criteria are met.

11.4 **Payment or Settlement of Cash-Based Awards and Other Stock-Based Awards**. Payment or settlement, if any, with respect to a Cash-Based Award or an Other Stock-Based Award shall be made in accordance with the terms of the Award, in cash, shares of Stock or other securities or any combination thereof as the Committee determines. To the extent applicable, payment or settlement with respect to each Cash-Based Award and Other Stock-Based Award shall be made in compliance with the requirements of Section 409A.

11.5 **Voting Rights; Dividend Equivalent Rights and Distributions.** Participants shall have no voting rights with respect to shares of Stock represented by Other Stock-Based Awards until the date of the issuance of such shares of Stock (as evidenced by the appropriate entry on the books of the Company or of a duly authorized transfer agent of the Company), if any, in settlement of such Award. However, the Committee, in its discretion, may provide in the Award Agreement evidencing any Other Stock-Based Award that the Participant shall be entitled to Dividend Equivalent Rights with respect to the payment of cash dividends on Stock during the period beginning on the date such Award is granted and ending, with respect to each share subject to the Award, on the earlier of the date the Award is settled or the date on which it is terminated. Such Dividend Equivalent Rights, if any, shall be paid in accordance with the provisions set forth in Section 9.4. Dividend Equivalent Rights shall not be granted with respect to Cash-Based Awards. In the event of a dividend or distribution paid in shares of Stock or other property or any other adjustment made upon a change in the capital structure of the Company as described in Section 4.3, appropriate adjustments shall be made in the Participant's Other Stock-Based Award so that it represents the right to receive upon settlement any and all new, substituted or additional securities or other property (other than normal cash dividends) to which the Participant would be entitled by reason of the shares of Stock issuable upon settlement of such Award, and all such new, substituted or additional securities or other property shall be immediately subject to the same Vesting Conditions and performance criteria, if any, as are applicable to the Award.

11.6 **Effect of Termination of Service**. Each Award Agreement evidencing a Cash-Based Award or Other Stock-Based Award shall set forth the extent to which the Participant shall have the right to retain such Award following termination of the Participant's Service. Such provisions shall be determined in the discretion of the Committee, need not be uniform among all Cash-Based Awards or Other Stock-Based Awards, and may reflect distinctions based on the reasons for termination, subject to the requirements of Section 409A, if applicable.

11.7 **Nontransferability of Cash-Based Awards and Other Stock-Based Awards.** Prior to the payment or settlement of a Cash-Based Award or Other Stock-Based Award, the Award shall not be subject in any manner to anticipation, alienation, sale, exchange,

transfer, assignment, pledge, encumbrance, or garnishment by creditors of the Participant or the Participant's beneficiary, except transfer by will or by the laws of descent and distribution. The Committee may impose such additional restrictions on any shares of Stock issued in settlement of Cash-Based Awards and Other Stock-Based Awards as it may deem advisable, including, without limitation, minimum holding period requirements, restrictions under applicable federal securities laws, under the requirements of any stock exchange or market upon which such shares of Stock are then listed and/or traded, or under any state securities laws or foreign law applicable to such shares of Stock.

12. **STANDARD FORMS OF AWARD AGREEMENT.**

12.1 **Award Agreements.** Each Award shall comply with and be subject to the terms and conditions set forth in the appropriate form of Award Agreement approved by the Committee and as amended from time to time. No Award or purported Award shall be a valid and binding obligation of the Company unless evidenced by a fully executed Award Agreement, which execution may be evidenced by electronic means. Any Award Agreement may consist of an appropriate form of Notice of Grant and a form of Agreement incorporated therein by reference, or such other form or forms, including electronic media, as the Committee may approve from time to time.

12.2 **Authority to Vary Terms.** The Committee shall have the authority from time to time to vary the terms of any standard form of Award Agreement either in connection with the grant or amendment of an individual Award or in connection with the authorization of a new standard form or forms; provided, however, that the terms and conditions of any such new, revised or amended standard form or forms of Award Agreement are not inconsistent with the terms of the Plan.

13. **CHANGE IN CONTROL.**

13.1 **Effect of Change in Control on Awards.** Subject to the requirements and limitations of Section 409A, if applicable, the Committee may provide for any one or more of the following:

(a) ***Accelerated Vesting.*** In its discretion, the Committee may provide in the grant of any Award or at any other time may take such action as it deems appropriate to provide for acceleration of the exercisability, vesting and/or settlement in connection with a Change in Control of each or any outstanding Award or portion thereof and shares acquired pursuant thereto upon such conditions, including termination of the Participant's Service prior to, upon, or following such Change in Control, and to such extent as the Committee shall determine.

(b) ***Assumption, Continuation or Substitution.*** In the event of a Change in Control, the surviving, continuing, successor, or purchasing corporation or other business entity or parent thereof, as the case may be (the "***Acquiror***"), may, without the consent of any Participant, either assume or continue the Company's rights and obligations under each or any Award or portion thereof outstanding immediately prior to the Change in Control or substitute for each or any such outstanding Award or portion thereof a substantially equivalent award with respect to the Acquiror's stock, as applicable. For purposes of this Section, if so

determined by the Committee in its discretion, an Award denominated in shares of Stock shall be deemed assumed if, following the Change in Control, the Award confers the right to receive, subject to the terms and conditions of the Plan and the applicable Award Agreement, for each share of Stock subject to the Award immediately prior to the Change in Control, the consideration (whether stock, cash, other securities or property or a combination thereof) to which a holder of a share of Stock on the effective date of the Change in Control was entitled; provided, however, that if such consideration is not solely common stock of the Acquiror, the Committee may, with the consent of the Acquiror, provide for the consideration to be received upon the exercise or settlement of the Award, for each share of Stock subject to the Award, to consist solely of common stock of the Acquiror equal in Fair Market Value to the per share consideration received by holders of Stock pursuant to the Change in Control. Any Award or portion thereof which is neither assumed or continued by the Acquiror in connection with the Change in Control nor exercised or settled as of the time of consummation of the Change in Control shall terminate and cease to be outstanding effective as of the time of consummation of the Change in Control.

(c) ***Cash-Out of Outstanding Stock-Based Awards.*** The Committee may, in its discretion and without the consent of any Participant, determine that, upon the occurrence of a Change in Control, each or any Award denominated in shares of Stock or portion thereof outstanding immediately prior to the Change in Control and not previously exercised or settled shall be canceled in exchange for a payment with respect to each vested share (and each unvested share, if so determined by the Committee) of Stock subject to such canceled Award in (i) cash, (ii) stock of the Company or of a corporation or other business entity a party to the Change in Control, or (iii) other property which, in any such case, shall be in an amount having a Fair Market Value equal to the Fair Market Value of the consideration to be paid per share of Stock in the Change in Control, reduced (but not below zero) by the exercise or purchase price per share, if any, under such Award. In the event such determination is made by the Committee, an Award having an exercise or purchase price per share equal to or greater than the Fair Market Value of the consideration to be paid per share of Stock in the Change in Control may be canceled without payment of consideration to the holder thereof. Payment pursuant to this Section (reduced by applicable withholding taxes, if any) shall be made to Participants in respect of the vested portions of their canceled Awards as soon as practicable following the date of the Change in Control and in respect of the unvested portions of their canceled Awards in accordance with the vesting schedules applicable to such Awards.

13.2 **Effect of Change in Control on Nonemployee Director Awards.** Subject to the requirements and limitations of Section 409A, if applicable, including as provided by Section 15.4(e), in the event of a Change in Control, each outstanding Nonemployee Director Award shall become immediately exercisable and vested in full and, except to the extent assumed, continued or substituted for pursuant to Section 13.1(b), shall be settled effective immediately prior to the time of consummation of the Change in Control.

13.3 **Federal Excise Tax Under Section 4999 of the Code.**

(a) ***Excess Parachute Payment.*** In the event that any acceleration of vesting pursuant to an Award and any other payment or benefit received or to be received by a Participant would subject the Participant to any excise tax pursuant to Section 4999 of the Code

due to the characterization of such acceleration of vesting, payment or benefit as an "excess parachute payment" under Section 280G of the Code, the Participant may elect to reduce the amount of any acceleration of vesting called for under the Award in order to avoid such characterization.

(b) ***Determination by Independent Accountants.*** To aid the Participant in making any election called for under Section 13.3(a), no later than the date of the occurrence of any event that might reasonably be anticipated to result in an "excess parachute payment" to the Participant as described in Section 13.3(a), the Company shall request a determination in writing by independent public accountants selected by the Company (the "***Accountants***"). As soon as practicable thereafter, the Accountants shall determine and report to the Company and the Participant the amount of such acceleration of vesting, payments and benefits which would produce the greatest after-tax benefit to the Participant. For the purposes of such determination, the Accountants may rely on reasonable, good faith interpretations concerning the application of Sections 280G and 4999 of the Code. The Company and the Participant shall furnish to the Accountants such information and documents as the Accountants may reasonably request in order to make their required determination. The Company shall bear all fees and expenses the Accountants charge in connection with their services contemplated by this Section.

14. **COMPLIANCE WITH SECURITIES LAW.**

The grant of Awards and the issuance of shares of Stock pursuant to any Award shall be subject to compliance with all applicable requirements of federal, state and foreign law with respect to such securities and the requirements of any stock exchange or market system upon which the Stock may then be listed. In addition, no Award may be exercised or shares issued pursuant to an Award unless (a) a registration statement under the Securities Act shall at the time of such exercise or issuance be in effect with respect to the shares issuable pursuant to the Award, or (b) in the opinion of legal counsel to the Company, the shares issuable pursuant to the Award may be issued in accordance with the terms of an applicable exemption from the registration requirements of the Securities Act. The inability of the Company to obtain from any regulatory body having jurisdiction the authority, if any, deemed by the Company's legal counsel to be necessary to the lawful issuance and sale of any shares hereunder shall relieve the Company of any liability in respect of the failure to issue or sell such shares as to which such requisite authority shall not have been obtained. As a condition to issuance of any Stock, the Company may require the Participant to satisfy any qualifications that may be necessary or appropriate, to evidence compliance with any applicable law or regulation and to make any representation or warranty with respect thereto as may be requested by the Company.

15. **COMPLIANCE WITH SECTION 409A.**

15.1 **Awards Subject to Section 409A.** The Company intends that Awards granted pursuant to the Plan shall either be exempt from or comply with Section 409A, and the Plan shall be so construed. The provisions of this Section 15 shall apply to any Award or portion thereof that constitutes or provides for payment of Section 409A Deferred Compensation. Such Awards may include, without limitation:

(a) A Nonstatutory Stock Option or SAR that includes any feature for the deferral of compensation other than the deferral of recognition of income until the later of (i) the exercise or disposition of the Award or (ii) the time the stock acquired pursuant to the exercise of the Award first becomes substantially vested.

(b) Any Restricted Stock Unit Award, Performance Award, Cash-Based Award or Other Stock-Based Award that either (i) provides by its terms for settlement of all or any portion of the Award at a time or upon an event that will or may occur later than the end of the Short-Term Deferral Period (as defined below) or (ii) permits the Participant granted the Award to elect one or more dates or events upon which the Award will be settled after the end of the Short-Term Deferral Period.

Subject to the provisions of Section 409A, the term "***Short-Term Deferral Period***" means the 2½ month period ending on the later of (i) the 15th day of the third month following the end of the Participant's taxable year in which the right to payment under the applicable portion of the Award is no longer subject to a substantial risk of forfeiture or (ii) the 15th day of the third month following the end of the Company's taxable year in which the right to payment under the applicable portion of the Award is no longer subject to a substantial risk of forfeiture. For this purpose, the term "substantial risk of forfeiture" shall have the meaning provided by Section 409A.

15.2 **Deferral and/or Distribution Elections.** Except as otherwise permitted or required by Section 409A, the following rules shall apply to any compensation deferral and/or payment elections (each, an "***Election***") that may be permitted or required by the Committee pursuant to an Award providing Section 409A Deferred Compensation:

(a) Elections must be in writing and specify the amount of the payment in settlement of an Award being deferred, as well as the time and form of payment as permitted by this Plan.

(b) Elections shall be made by the end of the Participant's taxable year prior to the year in which services commence for which an Award may be granted to such Participant.

(c) Elections shall continue in effect until a written revocation or change in Election is received by the Company, except that a written revocation or change in Election must be received by the Company prior to the last day for making the Election determined in accordance with paragraph (b) above or as permitted by Section 15.3.

15.3 **Subsequent Elections.** Except as otherwise permitted or required by Section 409A, any Award providing Section 409A Deferred Compensation which permits a subsequent Election to delay the payment or change the form of payment in settlement of such Award shall comply with the following requirements:

(a) No subsequent Election may take effect until at least twelve (12) months after the date on which the subsequent Election is made.

(b) Each subsequent Election related to a payment in settlement of an Award not described in Section 15.4(a)(ii), 15.4(a)(iii) or 15.4(a)(vi) must result in a delay of the payment for a period of not less than five (5) years from the date on which such payment would otherwise have been made.

(c) No subsequent Election related to a payment pursuant to Section 15.4(a)(iv) shall be made less than twelve (12) months before the date on which such payment would otherwise have been made.

(d) Subsequent Elections shall continue in effect until a written revocation or change in the subsequent Election is received by the Company, except that a written revocation or change in a subsequent Election must be received by the Company prior to the last day for making the subsequent Election determined in accordance the preceding paragraphs of this Section 15.3.

15.4 **Payment of Section 409A Deferred Compensation.**

(a) ***Permissible Payments.*** Except as otherwise permitted or required by Section 409A, an Award providing Section 409A Deferred Compensation must provide for payment in settlement of the Award only upon one or more of the following:

(i) The Participant's "separation from service" (as such term is defined by Section 409A);

(ii) The Participant's becoming "disabled" (as such term is defined by Section 409A);

(iii) The Participant's death;

(iv) A time or fixed schedule that is either (i) specified by the Committee upon the grant of an Award and set forth in the Award Agreement evidencing such Award or (ii) specified by the Participant in an Election complying with the requirements of Section 15.2 or 15.3, as applicable;

(v) A change in the ownership or effective control or the Company or in the ownership of a substantial portion of the assets of the Company determined in accordance with Section 409A; or

(vi) The occurrence of an "unforeseeable emergency" (as such term is defined by Section 409A).

(b) ***Required Delay in Payment to Specified Employee Pursuant to Separation from Service.*** Notwithstanding any provision of the Plan or an Award Agreement to the contrary, except as otherwise permitted by Section 409A, no payment pursuant to Section 15.4(a)(i) in settlement of an Award providing for Section 409A Deferred Compensation may be made to a Participant who is a "specified employee" (as such term is defined by Section 409A) as of the date of the Participant's separation from service before the date (the "***Delayed Payment Date***") that is six (6) months after the date of such Participant's separation from service, or, if earlier, the date of the Participant's death. All such amounts that would, but for this paragraph, become payable prior to the Delayed Payment Date shall be accumulated and paid on the Delayed Payment Date.

(c) ***Payment Upon Disability.*** All distributions payable by reason of a Participant becoming disabled shall be paid in a lump sum or in periodic installments as established by the Participant's Election. If the Participant has made no Election with respect to distributions upon becoming disabled, all such distributions shall be paid in a lump sum upon the determination that the Participant has become disabled.

(d) ***Payment Upon Death.*** If a Participant dies before complete distribution of amounts payable upon settlement of an Award subject to Section 409A, such undistributed amounts shall be distributed to his or her beneficiary under the distribution method for death established by the Participant's Election upon receipt by the Committee of satisfactory notice and confirmation of the Participant's death. If the Participant has made no Election with respect to distributions upon death, all such distributions shall be paid in a lump sum upon receipt by the Committee of satisfactory notice and confirmation of the Participant's death.

(e) ***Payment Upon Change in Control.*** Notwithstanding any provision of the Plan or an Award Agreement to the contrary, to the extent that any amount constituting Section 409A Deferred Compensation would become payable under this Plan by reason of a Change in Control, such amount shall become payable only if the event constituting a Change in Control would also constitute a change in ownership or effective control of the Company or a change in the ownership of a substantial portion of the assets of the Company within the meaning of Section 409A. Any Award which constitutes Section 409A Deferred Compensation and which would vest and otherwise become payable upon a Change in Control as a result of the failure of the Acquiror to assume, continue or substitute for such Award in accordance with Section 13.1(b) shall vest to the extent provided by such Award but shall be converted automatically at the effective time of such Change in Control into a right to receive, in cash on the date or dates such award would have been settled in accordance with its then existing settlement schedule (or as required by Section 15.4(b)), an amount or amounts equal in the aggregate to the intrinsic value of the Award at the time of the Change in Control.

(f) ***Payment Upon Unforeseeable Emergency.*** The Committee shall have the authority to provide in the Award Agreement evidencing any Award providing for Section 409A Deferred Compensation for payment in settlement of all or a portion of such Award in the event that a Participant establishes, to the satisfaction of the Committee, the occurrence of an unforeseeable emergency. In such event, the amount(s) distributed with respect to such unforeseeable emergency cannot exceed the amounts reasonably necessary to satisfy the emergency need plus amounts necessary to pay taxes reasonably anticipated as a result of such distribution(s), after taking into account the extent to which such emergency need is or may be relieved through reimbursement or compensation by insurance or otherwise, by liquidation of the Participant's assets (to the extent the liquidation of such assets would not itself cause severe financial hardship) or by cessation of deferrals under the Award. All distributions with respect to an unforeseeable emergency shall be made in a lump sum as soon as practicable following the Committee's determination that an unforeseeable emergency has occurred. The Committee's decision with respect to whether an unforeseeable emergency has occurred and the manner in which, if at all, the payment in settlement of an Award shall be altered or modified, shall be final, conclusive, and not subject to approval or appeal.

(g) ***Prohibition of Acceleration of Payments.*** Notwithstanding any provision of the Plan or an Award Agreement to the contrary, this Plan does not permit the acceleration of the time or schedule of any payment under an Award providing Section 409A Deferred Compensation, except as permitted by Section 409A.

16. **TAX WITHHOLDING.**

16.1 **Tax Withholding in General.** The Company shall have the right to deduct from any and all payments made under the Plan, or to require the Participant, through payroll withholding, cash payment or otherwise, to make adequate provision for, the federal, state, local and foreign taxes (including social insurance), if any, required by law to be withheld by any Participating Company with respect to an Award or the shares acquired pursuant thereto. The Company shall have no obligation to deliver shares of Stock, to release shares of Stock from an escrow established pursuant to an Award Agreement, or to make any payment in cash under the Plan until the Participating Company Group's tax withholding obligations have been satisfied by the Participant.

16.2 **Withholding in Shares.** The Company shall have the right, but not the obligation, to deduct from the shares of Stock issuable to a Participant upon the exercise or settlement of an Award, or to accept from the Participant the tender of, a number of whole shares of Stock having a Fair Market Value, as determined by the Company, equal to all or any part of the tax withholding obligations of any Participating Company. The Fair Market Value of any shares of Stock withheld or tendered to satisfy any such tax withholding obligations shall not exceed the amount determined by the applicable minimum statutory withholding rates.

17. **AMENDMENT, SUSPENSION OR TERMINATION OF PLAN.**

The Committee may amend, suspend or terminate the Plan at any time. However, without the approval of the Company's stockholders, there shall be (a) no increase in the maximum aggregate number of shares of Stock that may be issued under the Plan (except by operation of the provisions of Section 4.3), (b) no change in the class of persons eligible to receive Incentive Stock Options, and (c) no other amendment of the Plan that would require approval of the Company's stockholders under any applicable law, regulation or rule, including the rules of any stock exchange or quotation system upon which the Stock may then be listed or quoted. No amendment, suspension or termination of the Plan shall affect any then outstanding Award unless expressly provided by the Committee. Except as provided by the next sentence, no amendment, suspension or termination of the Plan may adversely affect any then outstanding Award without the consent of the Participant. Notwithstanding any other provision of the Plan to the contrary, the Committee may, in its sole and absolute discretion and without the consent of any Participant, amend the Plan or any Award Agreement, to take effect retroactively or otherwise, as it deems necessary or advisable for the purpose of conforming the Plan or such Award Agreement to any present or future law, regulation or rule applicable to the Plan, including, but not limited to, Section 409A.

18. **MISCELLANEOUS PROVISIONS.**

18.1 **Repurchase Rights.** Shares issued under the Plan may be subject to one or more repurchase options, or other conditions and restrictions as determined by the Committee in its discretion at the time the Award is granted. The Company shall have the right to assign at any time any repurchase right it may have, whether or not such right is then exercisable, to one or more persons as may be selected by the Company. Upon request by the Company, each Participant shall execute any agreement evidencing such transfer restrictions prior to the receipt of shares of Stock hereunder and shall promptly present to the Company any and all certificates representing shares of Stock acquired hereunder for the placement on such certificates of appropriate legends evidencing any such transfer restrictions.

18.2 **Forfeiture Events.**

(a) The Committee may specify in an Award Agreement that the Participant's rights, payments, and benefits with respect to an Award shall be subject to reduction, cancellation, forfeiture, or recoupment upon the occurrence of specified events, in addition to any otherwise applicable vesting or performance conditions of an Award. Such events may include, but shall not be limited to, termination of Service for Cause or any act by a Participant, whether before or after termination of Service, that would constitute Cause for termination of Service.

(b) If the Company is required to prepare an accounting restatement due to the material noncompliance of the Company, as a result of misconduct, with any financial reporting requirement under the securities laws, any Participant who knowingly or through gross negligence engaged in the misconduct, or who knowingly or through gross negligence failed to prevent the misconduct, and any Participant who is one of the individuals subject to automatic forfeiture under Section 304 of the Sarbanes-Oxley Act of 2002, shall reimburse the Company for (i) the amount of any payment in settlement of an Award received by such Participant during the twelve- (12-) month period following the first public issuance or filing with the United States Securities and Exchange Commission (whichever first occurred) of the financial document embodying such financial reporting requirement, and (ii) any profits realized by such Participant from the sale of securities of the Company during such twelve- (12-) month period.

18.3 **Provision of Information.** Each Participant shall be given access to information concerning the Company equivalent to that information generally made available to the Company's common stockholders.

18.4 **Rights as Employee, Consultant or Director.** No person, even though eligible pursuant to Section 5, shall have a right to be selected as a Participant, or, having been so selected, to be selected again as a Participant. Nothing in the Plan or any Award granted under the Plan shall confer on any Participant a right to remain an Employee, Consultant or Director or interfere with or limit in any way any right of a Participating Company to terminate the Participant's Service at any time. To the extent that an Employee of a Participating Company other than the Company receives an Award under the Plan, that Award shall in no event be understood or interpreted to mean that the Company is the Employee's employer or that the Employee has an employment relationship with the Company.

18.5 **Rights as a Stockholder.** A Participant shall have no rights as a stockholder with respect to any shares covered by an Award until the date of the issuance of such shares (as evidenced by the appropriate entry on the books of the Company or of a duly authorized transfer agent of the Company). No adjustment shall be made for dividends, distributions or other rights for which the record date is prior to the date such shares are issued, except as provided in Section 4.3 or another provision of the Plan.

18.6 **Delivery of Title to Shares.** Subject to any governing rules or regulations, the Company shall issue or cause to be issued the shares of Stock acquired pursuant to an Award and shall deliver such shares to or for the benefit of the Participant by means of one or more of the following: (a) by delivering to the Participant evidence of book entry shares of Stock credited to the account of the Participant, (b) by depositing such shares of Stock for the benefit of the Participant with any broker with which the Participant has an account relationship, or (c) by delivering such shares of Stock to the Participant in certificate form.

18.7 **Fractional Shares.** The Company shall not be required to issue fractional shares upon the exercise or settlement of any Award.

18.8 **Retirement and Welfare Plans**. Neither Awards made under this Plan nor shares of Stock or cash paid pursuant to such Awards may be included as "compensation" for purposes of computing the benefits payable to any Participant under any Participating Company's retirement plans (both qualified and non-qualified) or welfare benefit plans unless such other plan expressly provides that such compensation shall be taken into account in computing a Participant's benefit.

18.9 **Beneficiary Designation.** Subject to local laws and procedures, each Participant may file with the Company a written designation of a beneficiary who is to receive any benefit under the Plan to which the Participant is entitled in the event of such Participant's death before he or she receives any or all of such benefit. Each designation will revoke all prior designations by the same Participant, shall be in a form prescribed by the Company, and will be effective only when filed by the Participant in writing with the Company during the Participant's lifetime. If a married Participant designates a beneficiary other than the Participant's spouse, the effectiveness of such designation may be subject to the consent of the Participant's spouse. If a Participant dies without an effective designation of a beneficiary who is living at the time of the Participant's death, the Company will pay any remaining unpaid benefits to the Participant's legal representative.

18.10 **Severability**. If any one or more of the provisions (or any part thereof) of this Plan shall be held invalid, illegal or unenforceable in any respect, such provision shall be modified so as to make it valid, legal and enforceable, and the validity, legality and enforceability of the remaining provisions (or any part thereof) of the Plan shall not in any way be affected or impaired thereby.

18.11 **No Constraint on Corporate Action.** Nothing in this Plan shall be construed to: (a) limit, impair, or otherwise affect the Company's or another Participating Company's right or power to make adjustments, reclassifications, reorganizations, or changes of its capital or business structure, or to merge or consolidate, or dissolve, liquidate, sell, or transfer all or any part of its business or assets; or (b) limit the right or power of the Company or another Participating Company to take any action which such entity deems to be necessary or appropriate.

18.12 **Unfunded Obligation.** Participants shall have the status of general unsecured creditors of the Company. Any amounts payable to Participants pursuant to the Plan shall be considered unfunded and unsecured obligations for all purposes, including, without limitation, Title I of the Employee Retirement Income Security Act of 1974. No Participating Company shall be required to segregate any monies from its general funds, or to create any trusts, or establish any special accounts with respect to such obligations. The Company shall retain at all times beneficial ownership of any investments, including trust investments, which the Company may make to fulfill its payment obligations hereunder. Any investments or the creation or maintenance of any trust or any Participant account shall not create or constitute a trust or fiduciary relationship between the Committee or any Participating Company and a Participant, or otherwise create any vested or beneficial interest in any Participant or the Participant's creditors in any assets of any Participating Company. The Participants shall have no claim against any Participating Company for any changes in the value of any assets which may be invested or reinvested by the Company with respect to the Plan.

18.13 **Choice of Law.** Except to the extent governed by applicable federal law, the validity, interpretation, construction and performance of the Plan and each Award Agreement shall be governed by the laws of the State of Washington, without regard to its conflict of law rules.

IN WITNESS WHEREOF, the undersigned Secretary of the Company certifies that the foregoing sets forth the Adaptive Biotechnologies Corporation 2009 Equity Incentive Plan as duly adopted by the Board on December 17, 2009.

/s/ Jessica Andriesen

Jessica Andriesen, Secretary

PLAN HISTORY AND NOTES TO COMPANY

December 17, 2009	Board and shareholders adopt and approve Plan with a reserve of 2,000,000 shares.
February 9, 2010	Board recommends and shareholders adopt and approve Amendment to the Plan with a reserve of 2,400,000 shares.
December 20, 2011	Board recommends and shareholders adopt and approve Amendment to the Plan with a reserve of 4,200,000 shares.
December 21, 2011	Articles of Amendment filed changing corporate name to Adaptive Biotechnologies Corporation.
June 10, 2013	Board recommends and shareholders adopt and approve Amendment to the Plan with a reserve of 5,383,274 shares.
April 3, 2014	Board recommends and shareholders adopt and approve Amendment to the Plan with a reserve of 10,291,248 shares.
June 30, 2015	Board recommends and shareholders adopt and approve Amendment to the Plan with a reserve of 16,848,899 shares.
April 24, 2018	Board approves Amendment increasing Plan reserve by 6,000,000 shares, for a total reserve of 22,848,899.
May 2, 2018	Shareholders adopt and approve Amendment increasing reserve by 6,000,000 shares, for a total reserve of 22,848,899.

THE SECURITIES WHICH ARE THE SUBJECT OF THIS AGREEMENT HAVE BEEN ACQUIRED FOR INVESTMENT AND NOT WITH A VIEW TO, OR IN CONNECTION WITH, THE SALE OR DISTRIBUTION THEREOF. NO SUCH SALE OR DISPOSITION MAY BE EFFECTED WITHOUT AN EFFECTIVE REGISTRATION STATEMENT RELATED THERETO OR AN OPINION OF COUNSEL SATISFACTORY TO THE COMPANY THAT SUCH REGISTRATION IS NOT REQUIRED UNDER THE SECURITIES ACT OF 1933, AS AMENDED.

ADAPTIVE BIOTECHNOLOGIES CORPORATION
STOCK OPTION AGREEMENT

Adaptive Biotechnologies Corporation, formerly known as Adaptive TCR Corporation, has granted to the Participant named in the Notice of Grant of Stock Option (the "**Grant Notice**") to which this Stock Option Agreement (the "**Option Agreement**") is attached an option (the "**Option**") to purchase certain shares of Stock upon the terms and conditions set forth in the Grant Notice and this Option Agreement. The Option has been granted pursuant to and shall in all respects be subject to the terms and conditions of the Adaptive Biotechnologies Corporation 2009 Equity Incentive Plan (the "**Plan**"), as amended to the Date of Grant, the provisions of which are incorporated herein by reference. By signing the Grant Notice, the Participant: (a) acknowledges receipt of, and represents that the Participant has read and is familiar with, the Grant Notice, this Option Agreement and the Plan, (b) accepts the Option subject to all of the terms and conditions of the Grant Notice, this Option Agreement and the Plan, and (c) agrees to accept as binding, conclusive and final all decisions or interpretations of the Board upon any questions arising under the Grant Notice, this Option Agreement or the Plan.

1. **DEFINITIONS AND CONSTRUCTION.**

1.1 **Definitions.** Unless otherwise defined herein, capitalized terms shall have the meanings assigned to such terms in the Grant Notice or the Plan.

1.2 **Construction.** Captions and titles contained herein are for convenience only and shall not affect the meaning or interpretation of any provision of this Option Agreement. Except when otherwise indicated by the context, the singular shall include the plural and the plural shall include the singular. Use of the term "or" is not intended to be exclusive, unless the context clearly requires otherwise.

2. **TAX CONSEQUENCES.**

2.1 **Tax Status of Option.** This Option is intended to have the tax status designated in the Grant Notice.

(a) **Incentive Stock Option.** If the Grant Notice so designates, this Option is intended to be an Incentive Stock Option within the meaning of Section 422(b) of the Code, but the Company does not represent or warrant that this Option qualifies as such. The Participant should consult with the Participant's own tax advisor regarding the tax effects of this Option and the requirements necessary to obtain favorable income tax treatment under

Section 422 of the Code, including, but not limited to, holding period requirements. (NOTE TO PARTICIPANT: If the Option is exercised more than three (3) months after the date on which you cease to be an Employee (other than by reason of your death or permanent and total disability as defined in Section 22(e)(3) of the Code), the Option will be treated as a Nonstatutory Stock Option and not as an Incentive Stock Option to the extent required by Section 422 of the Code.)

(b) **Nonstatutory Stock Option.** If the Grant Notice so designates, this Option is intended to be a Nonstatutory Stock Option and shall not be treated as an Incentive Stock Option within the meaning of Section 422(b) of the Code.

2.2 **ISO Fair Market Value Limitation.** If the Grant Notice designates this Option as an Incentive Stock Option, then to the extent that the Option (together with all Incentive Stock Options granted to the Participant under all stock option plans of the Participating Company Group, including the Plan) becomes exercisable for the first time during any calendar year for shares having a Fair Market Value greater than One Hundred Thousand Dollars ($100,000), the portion of such options which exceeds such amount will be treated as Nonstatutory Stock Options. For purposes of this Section, options designated as Incentive Stock Options are taken into account in the order in which they were granted, and the Fair Market Value of stock is determined as of the time the option with respect to such stock is granted. If the Code is amended to provide for a different limitation from that set forth in this Section, such different limitation shall be deemed incorporated herein effective as of the date required or permitted by such amendment to the Code. If the Option is treated as an Incentive Stock Option in part and as a Nonstatutory Stock Option in part by reason of the limitation set forth in this Section, the Participant may designate which portion of such Option the Participant is exercising. In the absence of such designation, the Participant shall be deemed to have exercised the Incentive Stock Option portion of the Option first. Separate certificates representing each such portion shall be issued upon the exercise of the Option. (NOTE TO PARTICIPANT: If the aggregate Exercise Price of the Option (that is, the Exercise Price multiplied by the Number of Option Shares) plus the aggregate exercise price of any other Incentive Stock Options you hold (whether granted pursuant to the Plan or any other stock option plan of the Participating Company Group) is greater than $100,000, you should contact the Chief Financial Officer of the Company to ascertain whether the entire Option qualifies as an Incentive Stock Option.)

3. **ADMINISTRATION.**

All questions of interpretation concerning the Grant Notice, this Option Agreement, the Plan or any other form of agreement or other document employed by the Company in the administration of the Plan or the Option shall be determined by the Board. All such determinations by the Board shall be final, binding and conclusive upon all persons having an interest in the Option, unless fraudulent or made in bad faith. Any and all actions, decisions and determinations taken or made by the Board in the exercise of its discretion pursuant to the Plan or the Option or other agreement thereunder (other than determining questions of interpretation pursuant to the preceding sentence) shall be final, binding and conclusive upon all persons having an interest in the Option. Any Officer shall have the authority to act on behalf of the Company with respect to any matter, right, obligation, or election which is the responsibility of or which is allocated to the Company herein, provided the Officer has apparent authority with respect to such matter, right, obligation, or election.

4. **EXERCISE OF THE OPTION.**

4.1 **Right to Exercise**. Except as otherwise provided herein, the Option shall be exercisable on and after the Initial Vesting Date and prior to the termination of the Option (as provided in Section 6) in an amount not to exceed the number of Vested Shares less the number of shares previously acquired upon exercise of the Option, subject to the Company's repurchase rights set forth in Section 11. In no event shall the Option be exercisable for more shares than the Number of Option Shares, as adjusted pursuant to Section 9.

4.2 **Method of Exercise.** Exercise of the Option shall be by means of electronic or written notice (the "**Exercise Notice**") in a form authorized by the Company. An electronic Exercise Notice must be digitally signed or authenticated by the Participant in such manner as required by the notice and transmitted to the Company or an authorized representative of the Company (including a third-party administrator designated by the Company). In the event that the Participant is not authorized or is unable to provide an electronic Exercise Notice, the Option shall be exercised by a written Exercise Notice addressed to the Company, which shall be signed by the Participant and delivered in person, by certified or registered mail, return receipt requested, by confirmed facsimile transmission, or by such other means as the Company may permit, to the Company, or an authorized representative of the Company (including a third-party administrator designated by the Company). Each Exercise Notice, whether electronic or written, must state the Participant's election to exercise the Option, the number of whole shares of Stock for which the Option is being exercised and such other representations and agreements as to the Participant's investment intent with respect to such shares as may be required pursuant to the provisions of this Option Agreement. Further, each Exercise Notice must be received by the Company prior to the termination of the Option as set forth in Section 6 and must be accompanied by full payment of the aggregate Exercise Price for the number of shares of Stock being purchased. The Option shall be deemed to be exercised upon receipt by the Company of such electronic or written Exercise Notice and the aggregate Exercise Price.

4.3 **Payment of Exercise Price.**

(a) **Forms of Consideration Authorized.** Except as otherwise provided below, payment of the aggregate Exercise Price for the number of shares of Stock for which the Option is being exercised shall be made (i) in cash, by check or in cash equivalent, (ii) if permitted by the Company and subject to the limitations contained in Section 4.3(b), by means of (1) a Stock Tender Exercise, (2) a Cashless Exercise or (3) a Net-Exercise; or (iii) by any combination of the foregoing.

(b) **Limitations on Forms of Consideration.** The Company reserves, at any and all times, the right, in the Company's sole and absolute discretion, to establish, decline to approve or terminate any program or procedure providing for payment of the Exercise Price through any of the means described below, including with respect to the Participant notwithstanding that such program or procedures may be available to others.

(i) **Stock Tender Exercise.** A "**Stock Tender Exercise**" means the delivery of a properly executed Exercise Notice accompanied by (1) the Participant's tender to the Company, or attestation to the ownership, in a form acceptable to the Company of whole shares of Stock having a Fair Market Value that does not exceed the aggregate Exercise Price for the shares with respect to which the Option is exercised, and (2) the Participant's payment to the Company in cash of the remaining balance of such aggregate Exercise Price not satisfied by such shares' Fair Market Value. A Stock Tender Exercise shall not be permitted if it would constitute a violation of the provisions of any law, regulation or agreement restricting the redemption of the Company's stock. If required by the Company, the Option may not be exercised by tender to the Company, or attestation to the ownership, of shares of Stock unless such shares either have been owned by the Participant for a period of time required by the Company (and not used for another option exercise by attestation during such period) or were not acquired, directly or indirectly, from the Company.

(ii) **Cashless Exercise.** A Cashless Exercise shall be permitted only upon the class of shares subject to the Option becoming publicly traded in an established securities market. A "**Cashless Exercise**" means the delivery of a properly executed Exercise Notice together with irrevocable instructions to a broker in a form acceptable to the Company providing for the assignment to the Company of the proceeds of a sale or loan with respect to shares of Stock acquired upon the exercise of the Option in an amount not less than the aggregate Exercise Price for such shares (including, without limitation, through an exercise complying with the provisions of Regulation T as promulgated from time to time by the Board of Governors of the Federal Reserve System).

(iii) **Net-Exercise.** A "**Net-Exercise**" means the delivery of a properly executed Exercise Notice electing a procedure pursuant to which (1) the Company will reduce the number of shares otherwise issuable to the Participant upon the exercise of the Option by the largest whole number of shares having a Fair Market Value that does not exceed the aggregate Exercise Price for the shares with respect to which the Option is exercised, and (2) the Participant shall pay to the Company in cash the remaining balance of such aggregate Exercise Price not satisfied by such reduction in the number of whole shares to be issued. Following a Net-Exercise, the number of shares remaining subject to the Option, if any, shall be reduced by the sum of (1) the net number of shares issued to the Participant upon such exercise, and (2) the number of shares deducted by the Company for payment of the aggregate Exercise Price.

4.4 **Tax Withholding.**

(a) **In General.** At the time the Option is exercised, in whole or in part, or at any time thereafter as requested by a Participating Company, the Participant hereby authorizes withholding from payroll and any other amounts payable to the Participant, and otherwise agrees to make adequate provision for any sums required to satisfy the federal, state, local and foreign tax (including any social insurance) withholding obligations of the Participating Company Group, if any, which arise in connection with the Option. The Company shall have no obligation to deliver shares of Stock until the tax withholding obligations of the Participating Company Group have been satisfied by the Participant.

(b) **Withholding in or Directed Sale of Shares.** The Company shall have the right, but not the obligation, to require the Participant to satisfy all or any portion of a Participating Company's tax withholding obligations upon exercise of the Option by deducting from the shares of Stock otherwise issuable to the Participant upon such exercise a number of whole shares having a fair market value, as determined by the Company as of the date of exercise, not in excess of the amount of such tax withholding obligations determined by the applicable minimum statutory withholding rates. The Company may require the Participant to direct a broker, upon the exercise of the Option, to sell a portion of the shares subject to the Option determined by the Company in its discretion to be sufficient to cover the tax withholding obligations of any Participating Company and to remit an amount equal to such tax withholding obligations to the Company in cash.

4.5 **Beneficial Ownership of Shares; Certificate Registration.** The Participant hereby authorizes the Company, in its sole discretion, to deposit for the benefit of the Participant with any broker with which the Participant has an account relationship of which the Company has notice any or all shares acquired by the Participant pursuant to the exercise of the Option. Except as provided by the preceding sentence, a certificate for the shares as to which the Option is exercised shall be registered in the name of the Participant, or, if applicable, in the names of the heirs of the Participant.

4.6 **Restrictions on Grant of the Option and Issuance of Shares.** The grant of the Option and the issuance of shares of Stock upon exercise of the Option shall be subject to compliance with all applicable requirements of federal, state or foreign law with respect to such securities. The Option may not be exercised if the issuance of shares of Stock upon exercise would constitute a violation of any applicable federal, state or foreign securities laws or other law or regulations or the requirements of any stock exchange or market system upon which the Stock may then be listed. In addition, the Option may not be exercised unless (i) a registration statement under the Securities Act shall at the time of exercise of the Option be in effect with respect to the shares issuable upon exercise of the Option or (ii) in the opinion of legal counsel to the Company, the shares issuable upon exercise of the Option may be issued in accordance with the terms of an applicable exemption from the registration requirements of the Securities Act. THE PARTICIPANT IS CAUTIONED THAT THE OPTION MAY NOT BE EXERCISED UNLESS THE FOREGOING CONDITIONS ARE SATISFIED. ACCORDINGLY, THE PARTICIPANT MAY NOT BE ABLE TO EXERCISE THE OPTION WHEN DESIRED EVEN THOUGH THE OPTION IS VESTED. The inability of the Company to obtain from any regulatory body having jurisdiction the authority, if any, deemed by the Company's legal counsel to be necessary to the lawful issuance and sale of any shares subject to the Option shall relieve the Company of any liability in respect of the failure to issue or sell such shares as to which such requisite authority shall not have been obtained. As a condition to the exercise of the Option, the Company may require the Participant to satisfy any qualifications that may be necessary or appropriate, to evidence compliance with any applicable law or regulation and to make any representation or warranty with respect thereto as may be requested by the Company.

4.7 **Fractional Shares.** The Company shall not be required to issue fractional shares upon the exercise of the Option.

5. **NONTRANSFERABILITY OF THE OPTION.**

During the lifetime of the Participant, the Option shall be exercisable only by the Participant or the Participant's guardian or legal representative. The Option shall not be subject in any manner to anticipation, alienation, sale, exchange, transfer, assignment, pledge, encumbrance, or garnishment by creditors of the Participant or the Participant's beneficiary, except transfer by will or by the laws of descent and distribution. Following the death of the Participant, the Option, to the extent provided in Section 7, may be exercised by the Participant's legal representative or by any person empowered to do so under the deceased Participant's will or under the then applicable laws of descent and distribution.

6. **TERMINATION OF THE OPTION.**

The Option shall terminate and may no longer be exercised after the first to occur of (a) the close of business on the Option Expiration Date, (b) the close of business on the last date for exercising the Option following termination of the Participant's Service as described in Section 7, or (c) a Change in Control to the extent provided in Section 8.

7. **EFFECT OF TERMINATION OF SERVICE.**

7.1 **Option Exercisability.** The Option shall terminate immediately upon the Participant's termination of Service to the extent that it is then unvested and shall be exercisable after the Participant's termination of Service to the extent it is then vested only during the applicable time period as determined below and thereafter shall terminate.

(a) **Disability.** If the Participant's Service terminates because of the Disability of the Participant, the Option, to the extent unexercised and exercisable for Vested Shares on the date on which the Participant's Service terminated, may be exercised by the Participant (or the Participant's guardian or legal representative) at any time prior to the expiration of twelve (12) months after the date on which the Participant's Service terminated, but in any event no later than the Option Expiration Date.

(b) **Death.** If the Participant's Service terminates because of the death of the Participant, the Option, to the extent unexercised and exercisable for Vested Shares on the date on which the Participant's Service terminated, may be exercised by the Participant's legal representative or other person who acquired the right to exercise the Option by reason of the Participant's death at any time prior to the expiration of twelve (12) months after the date on which the Participant's Service terminated, but in any event no later than the Option Expiration Date. The Participant's Service shall be deemed to have terminated on account of death if the Participant dies within three (3) months after the Participant's termination of Service.

(c) **Termination for Cause.** Notwithstanding any other provision of this Option Agreement, if the Participant's Service is terminated for Cause, the Option shall terminate in its entirety and cease to be exercisable immediately upon such termination of Service.

(d) **Other Termination of Service.** If the Participant's Service terminates for any reason, except Disability, death or Cause, the Option, to the extent

unexercised and exercisable for Vested Shares by the Participant on the date on which the Participant's Service terminated, may be exercised by the Participant at any time prior to the expiration of three (3) months after the date on which the Participant's Service terminated, but in any event no later than the Option Expiration Date.

7.2 **Extension if Exercise Prevented by Law.** Notwithstanding the foregoing other than termination of the Participant's Service for Cause, if the exercise of the Option within the applicable time periods set forth in Section 7.1 is prevented by the provisions of Section 4.6, the Option shall remain exercisable until the later of (a) thirty (30) days after the date such exercise first would no longer be prevented by such provisions or (b) the end of the applicable time period under Section 7.1, but in any event no later than the Option Expiration Date.

8. **EFFECT OF CHANGE IN CONTROL.**

In the event of a Change in Control, except to the extent that the Board determines to settle the Option in accordance with Section 9.1(c) of the Plan, the surviving, continuing, successor, or purchasing corporation or other business entity or parent thereof, as the case may be (the "**Acquiror**"), may, without the consent of the Participant, assume or continue in full force and effect the Company's rights and obligations under all or any portion of the Option or substitute for all or any portion of the Option a substantially equivalent option for the Acquiror's stock. For purposes of this Section, the Option or any portion thereof shall be deemed assumed if, following the Change in Control, the Option confers the right to receive, subject to the terms and conditions of the Plan and this Option Agreement, for each share of Stock subject to such portion of the Option immediately prior to the Change in Control, the consideration (whether stock, cash, other securities or property or a combination thereof) to which a holder of a share of Stock on the effective date of the Change in Control was entitled (and if holders were offered a choice of consideration, the type of consideration chosen by the holders of a majority of the outstanding shares of Stock); provided, however, that if such consideration is not solely common stock of the Acquiror, the Board may, with the consent of the Acquiror, provide for the consideration to be received upon the exercise of the Option for each share of Stock to consist solely of common stock of the Acquiror equal in Fair Market Value to the per share consideration received by holders of Stock pursuant to the Change in Control. If any portion of such consideration may be received by holders of Stock pursuant to the Change in Control on a contingent or delayed basis, the Board may, in its discretion, determine such Fair Market Value per share as of the time of the Change in Control on the basis of the Board's good faith estimate of the present value of the probable future payment of such consideration. The Option shall terminate and cease to be outstanding effective as of the time of consummation of the Change in Control to the extent that the Option is neither assumed or continued by the Acquiror in connection with the Change in Control nor exercised as of the time of the Change in Control. Notwithstanding the foregoing, shares acquired upon exercise of the Option prior to the Change in Control and any consideration received pursuant to the Change in Control with respect to such shares shall continue to be subject to all applicable provisions of this Option Agreement except as otherwise provided herein.

9. **ADJUSTMENTS FOR CHANGES IN CAPITAL STRUCTURE.**

Subject to any required action by the shareholders of the Company and the requirements of Sections 409A and 424 of the Code to the extent applicable, in the event of any change in the Stock effected without receipt of consideration by the Company, whether through merger, consolidation, reorganization, reincorporation, recapitalization, reclassification, stock dividend, stock split, reverse stock split, split-up, split-off, spin-off, combination of shares, exchange of shares, or similar change in the capital structure of the Company, or in the event of payment of a dividend or distribution to the shareholders of the Company in a form other than Stock (excepting normal cash dividends) that has a material effect on the Fair Market Value of shares of Stock, appropriate and proportionate adjustments shall be made in the number, Exercise Price and kind of shares subject to the Option, in order to prevent dilution or enlargement of the Participant's rights under the Option. For purposes of the foregoing, conversion of any convertible securities of the Company shall not be treated as "effected without receipt of consideration by the Company." Any fractional share resulting from an adjustment pursuant to this Section shall be rounded down to the nearest whole number, and the Exercise Price shall be rounded up to the nearest whole cent. In no event may the Exercise Price be decreased to an amount less than the par value, if any, of the stock subject to the Option. Such adjustments shall be determined by the Board, and its determination shall be final, binding and conclusive.

10. **RIGHTS AS A SHAREHOLDER, DIRECTOR, EMPLOYEE OR CONSULTANT.**

The Participant shall have no rights as a shareholder with respect to any shares covered by the Option until the date of the issuance of the shares for which the Option has been exercised (as evidenced by the appropriate entry on the books of the Company or of a duly authorized transfer agent of the Company). No adjustment shall be made for dividends, distributions or other rights for which the record date is prior to the date the shares are issued, except as provided in Section 9. If the Participant is an Employee, the Participant understands and acknowledges that, except as otherwise provided in a separate, written employment agreement between a Participating Company and the Participant, the Participant's employment is "at will" and is for no specified term. Nothing in this Option Agreement shall confer upon the Participant any right to continue in the Service of a Participating Company or interfere in any way with any right of the Participating Company Group to terminate the Participant's Service as a Director, an Employee or Consultant, as the case may be, at any time.

11. **RIGHT OF FIRST REFUSAL.**

11.1 **Grant of Right of First Refusal.** Except as provided in Section 11.7 and Section 16 below, in the event the Participant, the Participant's legal representative, or other holder of shares acquired upon exercise of the Option proposes to sell, exchange, transfer, pledge, or otherwise dispose of any Vested Shares (the "**Transfer Shares**") to any person or entity, including, without limitation, any shareholder of a Participating Company, the Company shall have the right to repurchase the Transfer Shares under the terms and subject to the conditions set forth in this Section 11 (the "**Right of First Refusal**").

11.2 **Notice of Proposed Transfer.** Prior to any proposed transfer of the Transfer Shares, the Participant shall deliver written notice (the "**Transfer Notice**") to the

Company describing fully the proposed transfer, including the number of Transfer Shares, the name and address of the proposed transferee (the "**Proposed Transferee**") and, if the transfer is voluntary, the proposed transfer price, and containing such information necessary to show the bona fide nature of the proposed transfer. In the event of a bona fide gift or involuntary transfer, the proposed transfer price shall be deemed to be the Fair Market Value of the Transfer Shares, as determined by the Board in good faith. If the Participant proposes to transfer any Transfer Shares to more than one Proposed Transferee, the Participant shall provide a separate Transfer Notice for the proposed transfer to each Proposed Transferee. The Transfer Notice shall be signed by both the Participant and the Proposed Transferee and must constitute a binding commitment of the Participant and the Proposed Transferee for the transfer of the Transfer Shares to the Proposed Transferee subject only to the Right of First Refusal.

11.3 **Bona Fide Transfer.** If the Company determines that the information provided by the Participant in the Transfer Notice is insufficient to establish the bona fide nature of a proposed voluntary transfer, the Company shall give the Participant written notice of the Participant's failure to comply with the procedure described in this Section 11, and the Participant shall have no right to transfer the Transfer Shares without first complying with the procedure described in this Section 11. The Participant shall not be permitted to transfer the Transfer Shares if the proposed transfer is not bona fide.

11.4 **Exercise of Right of First Refusal.** If the Company determines the proposed transfer to be bona fide, the Company shall have the right to purchase all, but not less than all, of the Transfer Shares (except as the Company and the Participant otherwise agree) at the purchase price and on the terms set forth in the Transfer Notice by delivery to the Participant of a notice of exercise of the Right of First Refusal within thirty (30) days after the date the Transfer Notice is delivered to the Company. The Company's exercise or failure to exercise the Right of First Refusal with respect to any proposed transfer described in a Transfer Notice shall not affect the Company's right to exercise the Right of First Refusal with respect to any proposed transfer described in any other Transfer Notice, whether or not such other Transfer Notice is issued by the Participant or issued by a person other than the Participant with respect to a proposed transfer to the same Proposed Transferee. If the Company exercises the Right of First Refusal, the Company and the Participant shall thereupon consummate the sale of the Transfer Shares to the Company on the terms set forth in the Transfer Notice within sixty (60) days after the date the Transfer Notice is delivered to the Company (unless a longer period is offered by the Proposed Transferee); provided, however, that in the event the Transfer Notice provides for the payment for the Transfer Shares other than in cash, the Company shall have the option of paying for the Transfer Shares by the present value cash equivalent of the consideration described in the Transfer Notice as reasonably determined by the Company. For purposes of the foregoing, cancellation of any indebtedness of the Participant to any Participating Company shall be treated as payment to the Participant in cash to the extent of the unpaid principal and any accrued interest canceled. Notwithstanding anything contained in this Section to the contrary, the period during which the Company may exercise the Right of First Refusal and consummate the purchase of the Transfer Shares from the Participant shall terminate no sooner than the completion of a period of eight (8) months following the date on which the Participant acquired the Transfer Shares upon exercise of the Option.

11.5 **Failure to Exercise Right of First Refusal.** If the Company fails to exercise the Right of First Refusal in full (or to such lesser extent as the Company and the Participant otherwise agree) within the period specified in Section 11.4 above, the Participant may conclude a transfer to the Proposed Transferee of the Transfer Shares on the terms and conditions described in the Transfer Notice, provided such transfer occurs not later than ninety (90) days following delivery to the Company of the Transfer Notice or, if applicable, following the end of the period described in the last sentence of Section 11.4. The Company shall have the right to demand further assurances from the Participant and the Proposed Transferee (in a form satisfactory to the Company) that the transfer of the Transfer Shares was actually carried out on the terms and conditions described in the Transfer Notice. No Transfer Shares shall be transferred on the books of the Company until the Company has received such assurances, if so demanded, and has approved the proposed transfer as bona fide. Any proposed transfer on terms and conditions different from those described in the Transfer Notice, as well as any subsequent proposed transfer by the Participant, shall again be subject to the Right of First Refusal and shall require compliance by the Participant with the procedure described in this Section 11.

11.6 **Transferees of Transfer Shares.** All transferees of the Transfer Shares or any interest therein, other than the Company, shall be required as a condition of such transfer to agree in writing (in a form satisfactory to the Company) that such transferee shall receive and hold such Transfer Shares or interest therein subject to all of the terms and conditions of this Option Agreement, including this Section 11 providing for the Right of First Refusal with respect to any subsequent transfer. Any sale or transfer of any shares acquired upon exercise of the Option shall be void unless the provisions of this Section 11 are met.

11.7 **Transfers Not Subject to Right of First Refusal.** The Right of First Refusal shall not apply to any transfer or exchange of the shares acquired upon exercise of the Option if such transfer or exchange is in connection with an Ownership Change Event. If the consideration received pursuant to such transfer or exchange consists of stock of a Participating Company, such consideration shall remain subject to the Right of First Refusal unless the provisions of Section 11.9 result in a termination of the Right of First Refusal.

11.8 **Assignment of Right of First Refusal.** The Company shall have the right to assign the Right of First Refusal at any time, whether or not there has been an attempted transfer, to one or more persons as may be selected by the Company.

11.9 **Early Termination of Right of First Refusal.** The other provisions of this Option Agreement notwithstanding, the Right of First Refusal shall terminate and be of no further force and effect upon (a) the occurrence of a Change in Control, unless the Acquiror assumes the Company's rights and obligations under the Option or substitutes a substantially equivalent option for the Acquiror's stock for the Option, or (b) the existence of a public market for the class of shares subject to the Right of First Refusal. A "**public market**" shall be deemed to exist if (i) such stock is listed on a national securities exchange (as that term is used in the Exchange Act) or (ii) such stock is traded on the over-the-counter market and prices therefor are published daily on business days in a recognized financial journal.

12. **STOCK DISTRIBUTIONS SUBJECT TO OPTION AGREEMENT.**

If, from time to time, there is any stock dividend, stock split or other change, as described in Section 9, in the character or amount of any of the outstanding stock of the corporation the stock of which is subject to the provisions of this Option Agreement, then in such event any and all new, substituted or additional securities to which the Participant is entitled by reason of the Participant's ownership of the shares acquired upon exercise of the Option shall be immediately subject to the Right of First Refusal with the same force and effect as the shares subject to the Right of First Refusal immediately before such event.

13. **NOTICE OF SALES UPON DISQUALIFYING DISPOSITION.**

The Participant shall dispose of the shares acquired pursuant to the Option only in accordance with the provisions of this Option Agreement. In addition, if the Grant Notice designates this Option as an Incentive Stock Option, the Participant shall (a) promptly notify the Chief Financial Officer of the Company if the Participant disposes of any of the shares acquired pursuant to the Option within one (1) year after the date the Participant exercises all or part of the Option or within two (2) years after the Date of Grant and (b) provide the Company with a description of the circumstances of such disposition. Until such time as the Participant disposes of such shares in a manner consistent with the provisions of this Option Agreement, unless otherwise expressly authorized by the Company, the Participant shall hold all shares acquired pursuant to the Option in the Participant's name (and not in the name of any nominee) for the one-year period immediately after the exercise of the Option and the two-year period immediately after Date of Grant. At any time during the one-year or two-year periods set forth above, the Company may place a legend on any certificate representing shares acquired pursuant to the Option requesting the transfer agent for the Company's stock to notify the Company of any such transfers. The obligation of the Participant to notify the Company of any such transfer shall continue notwithstanding that a legend has been placed on the certificate pursuant to the preceding sentence.

14. **LEGENDS.**

The Company may at any time place legends referencing the Right of First Refusal and any applicable federal, state or foreign securities law restrictions on all certificates representing shares of stock subject to the provisions of this Option Agreement. The Participant shall, at the request of the Company, promptly present to the Company any and all certificates representing shares acquired pursuant to the Option in the possession of the Participant in order to carry out the provisions of this Section. Unless otherwise specified by the Company, legends placed on such certificates may include, but shall not be limited to, the following:

14.1 "THE SECURITIES EVIDENCED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED, AND MAY NOT BE SOLD, TRANSFERRED, ASSIGNED OR HYPOTHECATED UNLESS THERE IS AN EFFECTIVE REGISTRATION STATEMENT UNDER SUCH ACT COVERING SUCH SECURITIES, THE SALE IS MADE IN ACCORDANCE WITH RULE 144 OR RULE 701 UNDER THE ACT, OR THE COMPANY RECEIVES AN OPINION OF COUNSEL REASONABLY SATISFACTORY TO THE COMPANY, STATING THAT SUCH SALE, TRANSFER, ASSIGNMENT OR HYPOTHECATION IS EXEMPT FROM THE REGISTRATION AND PROSPECTUS DELIVERY REQUIREMENTS OF SUCH ACT."

14.2 “THE SHARES REPRESENTED BY THIS CERTIFICATE ARE SUBJECT TO CERTAIN RESTRICTIONS ON TRANSFER AND REPURCHASE OPTIONS IN FAVOR OF THE CORPORATION OR ITS ASSIGNEE SET FORTH IN AN AGREEMENT BETWEEN THE CORPORATION AND THE REGISTERED HOLDER, OR SUCH HOLDER’’S PREDECESSOR IN INTEREST, A COPY OF WHICH IS ON FILE AT THE PRINCIPAL OFFICE OF THIS CORPORATION.”

14.3 “THE SHARES EVIDENCED BY THIS CERTIFICATE WERE ISSUED BY THE CORPORATION TO THE REGISTERED HOLDER UPON EXERCISE OF AN INCENTIVE STOCK OPTION AS DEFINED IN SECTION 422 OF THE INTERNAL REVENUE CODE OF 1986, AS AMENDED (“ISO”). IN ORDER TO OBTAIN THE PREFERENTIAL TAX TREATMENT AFFORDED TO ISOs, THE SHARES SHOULD NOT BE TRANSFERRED PRIOR TO [INSERT DISQUALIFYING DISPOSITION DATE HERE]. SHOULD THE REGISTERED HOLDER ELECT TO TRANSFER ANY OF THE SHARES PRIOR TO THIS DATE AND FOREGO ISO TAX TREATMENT, THE TRANSFER AGENT FOR THE SHARES SHALL NOTIFY THE CORPORATION IMMEDIATELY. THE REGISTERED HOLDER SHALL HOLD ALL SHARES PURCHASED UNDER THE INCENTIVE STOCK OPTION IN THE REGISTERED HOLDER’S NAME (AND NOT IN THE NAME OF ANY NOMINEE) PRIOR TO THIS DATE OR UNTIL TRANSFERRED AS DESCRIBED ABOVE.”

15. **LOCK-UP AGREEMENT.**

The Participant hereby agrees that in the event of any underwritten public offering of stock, including an initial public offering of stock, made by the Company pursuant to an effective registration statement filed under the Securities Act, the Participant shall not offer, sell, contract to sell, pledge, hypothecate, grant any option to purchase or make any short sale of, or otherwise dispose of any shares of stock of the Company or any rights to acquire stock of the Company for such period of time from and after the effective date of such registration statement as may be established by the underwriter for such public offering; provided, however, that such period of time shall not exceed one hundred eighty (180) days from the effective date of the registration statement to be filed in connection with such public offering. The foregoing limitation shall not apply to shares registered in the public offering under the Securities Act (and for such additional period, not to exceed 34 days, after the expiration of the 180-day period, as the underwriters of the Company shall request in order to facilitate compliance with NASD Rule 2711). The Participant hereby agrees to enter into any agreement reasonably required by the underwriters to implement the foregoing within a reasonable timeframe if so requested by the Company.

16. **RESTRICTIONS ON TRANSFER OF SHARES.**

No shares acquired upon exercise of the Option may be sold, exchanged, transferred (including, without limitation, any transfer to a nominee or agent of the Participant), assigned, pledged, hypothecated or otherwise disposed of, including by operation of law in any manner

which violates any of the provisions of this Option Agreement, and any such attempted disposition shall be void. The Company shall not be required (a) to transfer on its books any shares which will have been transferred in violation of any of the provisions set forth in this Option Agreement or (b) to treat as owner of such shares or to accord the right to vote as such owner or to pay dividends to any transferee to whom such shares will have been so transferred.

17. **MISCELLANEOUS PROVISIONS.**

17.1 **Termination or Amendment.** The Board may terminate or amend the Plan or the Option at any time; provided, however, that except as provided in Section 8 in connection with a Change in Control, no such termination or amendment may adversely affect the Option or any unexercised portion hereof without the consent of the Participant unless such termination or amendment is necessary to comply with any applicable law or government regulation, including, but not limited to Section 409A of the Code. No amendment or addition to this Option Agreement shall be effective unless in writing.

17.2 **Compliance with Section 409A**. The Company intends that income realized by the Participant pursuant to the Plan and this Option Agreement will not be subject to taxation under Section 409A of the Code. The provisions of the Plan and this Option Agreement shall be interpreted and construed in favor of satisfying any applicable requirements of Section 409A of the Code. The Company, in its reasonable discretion, may amend (including retroactively) the Plan and this Agreement in order to conform to the applicable requirements of Section 409A of the Code, including amendments to facilitate the Participant's ability to avoid taxation under Section 409A of the Code. **However, the preceding provisions shall not be construed as a guarantee by the Company of any particular tax result for income realized by the Participant pursuant to the Plan or this Option Agreement.** In any event, and except for the responsibilities of the Company set forth in Section 4.4, no Participating Company shall be responsible for the payment of any applicable taxes incurred by the Participant on income realized by the Participant pursuant to the Plan or this Option Agreement.

17.3 **Further Instruments.** The parties hereto agree to execute such further instruments and to take such further action as may reasonably be necessary to carry out the intent of this Option Agreement.

17.4 **Binding Effect.** This Option Agreement shall inure to the benefit of the successors and assigns of the Company and, subject to the restrictions on transfer set forth herein, be binding upon the Participant and the Participant's heirs, executors, administrators, successors and assigns.

17.5 **Delivery of Documents and Notices.** Any document relating to participation in the Plan, or any notice required or permitted hereunder shall be given in writing and shall be deemed effectively given (except to the extent that this Option Agreement provides for effectiveness only upon actual receipt of such notice) upon personal delivery, electronic delivery at the e-mail address, if any, provided for the Participant by a Participating Company, or upon deposit in the U.S. Post Office or foreign postal service, by registered or certified mail, or with a nationally recognized overnight courier service, with postage and fees prepaid, addressed to the other party at the address of such party set forth in the Grant Notice or at such other address as such party may designate in writing from time to time to the other party.

(a) **Description of Electronic Delivery.** The Plan documents, which may include but do not necessarily include: the Plan, the Grant Notice, this Option Agreement, and any reports of the Company provided generally to the Company's shareholders, may be delivered to the Participant electronically. In addition, if permitted by the Company, the Participant may deliver electronically the Grant Notice and Exercise Notice called for by Section 4.2 to the Company or to such third party involved in administering the Plan as the Company may designate from time to time. Such means of electronic delivery may include but do not necessarily include the delivery of a link to a Company intranet or the Internet site of a third party involved in administering the Plan, the delivery of the document via e-mail or such other means of electronic delivery specified by the Company.

(b) **Consent to Electronic Delivery.** The Participant acknowledges that the Participant has read Section 17.5(a) of this Option Agreement and consents to the electronic delivery of the Plan documents and, if permitted by the Company, the delivery of the Grant Notice and Exercise Notice, as described in Section 17.5(a). The Participant acknowledges that he or she may receive from the Company a paper copy of any documents delivered electronically at no cost to the Participant by contacting the Company by telephone or in writing. The Participant further acknowledges that the Participant will be provided with a paper copy of any documents if the attempted electronic delivery of such documents fails. Similarly, the Participant understands that the Participant must provide the Company or any designated third party administrator with a paper copy of any documents if the attempted electronic delivery of such documents fails. The Participant may revoke his or her consent to the electronic delivery of documents described in Section 17.5(a) or may change the electronic mail address to which such documents are to be delivered (if Participant has provided an electronic mail address) at any time by notifying the Company of such revoked consent or revised e-mail address by telephone, postal service or electronic mail. Finally, the Participant understands that he or she is not required to consent to electronic delivery of documents described in Section 17.5(a).

17.6 **Integrated Agreement.** The Grant Notice, this Option Agreement and the Plan, together with any employment, service or other agreement with the Participant and a Participating Company referring to the Option, shall constitute the entire understanding and agreement of the Participant and the Participating Company Group with respect to the subject matter contained herein or therein and supersede any prior agreements, understandings, restrictions, representations, or warranties among the Participant and the Participating Company Group with respect to such subject matter. To the extent contemplated herein or therein, the provisions of the Grant Notice, the Option Agreement and the Plan shall survive any exercise of the Option and shall remain in full force and effect.

17.7 **Applicable Law.** This Option Agreement shall be governed by the laws of the State of Washington as such laws are applied to agreements between Washington residents entered into and to be performed entirely within the State of Washington.

17.8 **Counterparts.** The Grant Notice may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

☐ Incentive Stock Option
☐ Nonstatutory Stock Option

Participant: _____
Date: _____

STOCK OPTION EXERCISE NOTICE

Adaptive Biotechnologies Corporation
Attention: President
1551 Eastlake Avenue East Suite 200
Seattle, WA 98102

Ladies and Gentlemen:

1. **Option.** I was granted an option (the "**Option**") to purchase shares of the common stock (the "**Shares**") of Adaptive Biotechnologies Corporation (the "**Company**") pursuant to the Company's 2009 Equity Incentive Plan (the "**Plan**"), my Notice of Grant of Stock Option (the "**Grant Notice**") and my Stock Option Agreement (the "**Option Agreement**") as follows:

Date of Grant: _____

Number of Option Shares: _____

Exercise Price per Share: $ _____

2. **Exercise of Option.** I hereby elect to exercise the Option to purchase the following number of Shares, all of which are Vested Shares, in accordance with the Grant Notice and the Option Agreement:

Total Shares Purchased: _____

Total Exercise Price (Total Shares X Price per Share) $ _____

3. **Payments.** I enclose payment in full of the total exercise price for the Shares in the following form(s), as authorized by my Option Agreement:

☐ Cash: $ _____

☐ Check: $ _____

☐ Stock Tender Exercise: Contact Plan Administrator

☐ Cashless Exercise: Contact Plan Administrator

☐ Net Exercise: Contact Plan Administrator

4. **Tax Withholding.** I authorize payroll withholding and otherwise will make adequate provision for the federal, state, local and foreign tax withholding obligations of the Company, if any, in connection with the Option. If I am exercising a Nonstatutory Stock Option, I enclose payment in full of my withholding taxes, if any, as follows:

(Contact Plan Administrator for amount of tax due.)

☐ Cash: $ _____

☐ Check: $ _____

5. **Participant Information.**

My address is: _____

_____

My Social Security Number is: _____

6. **Notice of Disqualifying Disposition.** If the Option is an Incentive Stock Option, I agree that I will promptly notify the Chief Financial Officer of the Company if I transfer any of the Shares within one (1) year from the date I exercise all or part of the Option or within two (2) years of the Date of Grant.

7. **Binding Effect.** I agree that the Shares are being acquired in accordance with and subject to the terms, provisions and conditions of the Grant Notice, the Option Agreement, including the Right of First Refusal set forth therein, and the Plan, to all of which I hereby expressly assent. This Agreement shall inure to the benefit of and be binding upon my heirs, executors, administrators, successors and assigns.

8. **Transfer.** I understand and acknowledge that the Shares have not been registered under the Securities Act of 1933, as amended (the "**Securities Act**"), and that consequently the Shares must be held indefinitely unless they are subsequently registered under the Securities Act, an exemption from such registration is available, or they are sold in accordance with Rule 144 or Rule 701 under the Securities Act. I further understand and acknowledge that the Company is under no obligation to register the Shares. I understand that the certificate or certificates evidencing the Shares will be imprinted with legends which prohibit the transfer of the Shares unless they are registered or such registration is not required in the opinion of legal counsel satisfactory to the Company.

I am aware that Rule 144 under the Securities Act, which permits limited public resale of securities acquired in a nonpublic offering, is not currently available with respect to the Shares and, in any event, is available only if certain conditions are satisfied. I understand that any sale of the Shares that might be made in reliance upon Rule 144 may only be made in limited amounts in accordance with the terms and conditions of such rule and that a copy of Rule 144 will be delivered to me upon request.

I understand that I am purchasing the Shares pursuant to the terms of the Plan, the Grant Notice and my Option Agreement, copies of which I have received and carefully read and understand.

Very truly yours,

_____

(Signature)

Receipt of the above is hereby acknowledged.

Adaptive Biotechnologies Corporation

By: _____

Title: _____

Dated: _____

LEASE AGREEMENT

THIS LEASE AGREEMENT (this "**Lease**") is made this 21 day of July, 2011, between **ARE-SEATTLE NO. 11, LLC,** a Delaware limited liability company ("**Landlord**"), and **ADAPTIVE TCR CORPORATION**, a Washington corporation ("**Tenant**").

Address:	1551 Eastlake Avenue, Seattle, Washington
Premises:	That portion of the second floor of the Project, containing approximately 7,724 rentable square feet, as determined by Landlord, as shown on **Exhibit A**, subject to adjustment as provided in Section 5.
Project:	The real property on which the building (the "**Building**") in which the Premises are located, together with all improvements thereon and appurtenances thereto as described on **Exhibit B**.
Base Rent:	$20,400.00 per month, subject to adjustment as provided in Section 4.

Rentable Area of Premises: 7,724 sq. ft., subject to adjustment as provided in Section 5.

Rentable Area of Project: 115,738 sq. ft.

Tenant's Share of Operating Expenses: 6.67%, subject to adjustment as provided in Section 5.

Security Deposit: $61,200.00 **Target Commencement Date:** February 1, 2012

Rent Adjustment Percentage: 2.5%

Base Term:	Beginning on the Commencement Date and ending 64 months from the first day of the first full month after the Rent Commencement Date.
Permitted Use:	Biomedical laboratory, related office and other related uses consistent with the character of the Project and otherwise in compliance with the provisions of Section 7 hereof.

Address for Rent Payment:
P.O. Box 975383
Dallas, TX 75397-5383

Landlord's Notice Address:
385 E. Colorado Boulevard, Suite 299
Pasadena, CA 91101
Attention: Corporate Secretary

Tenant's Notice Address After Commencement Date:
1551 Eastlake Avenue
Seattle, Washington 98102
Attention: Lease Administrator

Tenant Notice Address Prior to Commencement Date:
307 Westlake Avenue N
Suite 300
Seattle, WA 98109

The following Exhibits and Addenda are attached hereto and incorporated herein by this reference:

☒ **EXHIBIT A** - PREMISES DESCRIPTION ☒ **EXHIBIT B** - DESCRIPTION OF PROJECT
☒ **EXHIBIT C** - WORK LETTER ☒ **EXHIBIT D** - COMMENCEMENT DATE
☒ **EXHIBIT E** - RULES AND REGULATIONS ☒ **EXHIBIT F** - TENANT'S PERSONAL PROPERTY

☒ **EXHIBIT G** - ASBESTOS DISCLOSURE ☒ **EXHIBIT H** - EXPANSION PREMISES ☒ **EXHIBIT I** SPACE PLANS

1. **Lease of Premises**. Upon and subject to all of the terms and conditions hereof, Landlord hereby leases the Premises to Tenant and Tenant hereby leases the Premises from Landlord. The portions of the Project which are for the non-exclusive use of tenants of the Project are collectively referred to herein as the "**Common Areas**." Landlord reserves the right to modify Common Areas, provided that such modifications do not materially adversely affect Tenant's use of the Premises for the Permitted Use. Tenant acknowledges and agrees that (i) the roof deck to be located on a portion of the roof of the Building and the auditorium to be located on the first floor of the Building shall be part of the Common Areas of the Building, (ii) the roof deck and the auditorium shall be available to all of the tenants of the Building on a first come, first served basis or, at Landlord's option, a reservation basis, and (iii) Landlord shall not be responsible for enforcing any party's right to use the roof deck or the auditorium. Tenant shall use the roof deck and the auditorium in a manner that complies with all applicable Legal Requirements and any and all rules and regulations which may be adopted by Landlord from time to time.

2. **Delivery; Acceptance of Premises; Commencement Date**. Landlord shall use reasonable efforts to deliver the Premises to Tenant on or before the Target Commencement Date, with Landlord's Work, if any, Substantially Completed ("**Delivery**" or "**Deliver**"). If Landlord fails to timely Deliver the Premises, Landlord shall not be liable to Tenant for any loss or damage resulting therefrom, and this Lease shall not be void or voidable except as provided herein. Notwithstanding the foregoing, Base Rent payable with respect to the Premises shall be abated 1 day for each day after the Target Commencement Date (as the same may be extended for Force Majeure delays and Tenant Delays) that Landlord fails to Deliver the Premises to Tenant. If Landlord does not Deliver the Premises within 90 days of the Target Commencement Date for any reason other than Force Majeure Delays and Tenant Delays, this Lease may be terminated by Landlord or Tenant by written notice to the other, and if so terminated by either: (a) the Security Deposit, or any balance thereof (i.e., after deducting therefrom all amounts to which Landlord is entitled under the provisions of this Lease), shall be returned to Tenant, and (b) neither Landlord nor Tenant shall have any further rights, duties or obligations under this Lease, except with respect to provisions which expressly survive termination of this Lease. As used herein, the terms "**Landlord's Work**," "Tenant Delays" and "**Substantially Completed**" shall have the meanings set forth for such terms in the Work Letter. If neither Landlord nor Tenant elects to void this Lease within 7 business days of the lapse of such 90 day period, such right to void this Lease shall be waived and this Lease shall remain in full force and effect.

The "**Commencement Date**" shall be the earlier of: (i) the date Landlord Delivers the Premises to Tenant; or (ii) the date Landlord could have Delivered the Premises but for Tenant Delays; provided, however, that in no event shall the Commencement Date occur earlier than February 1, 2012. The "Rent Commencement Date" shall be the date that is 4 months after the Commencement Date. Upon request of Landlord, Tenant shall execute and deliver a written acknowledgment of the Commencement Date, the Rent Commencement Date and the expiration date of the Term when such are established in the form of the "Acknowledgement of Commencement Date" attached to this Lease as **Exhibit D**; provided, however, Tenant's failure to execute and deliver such acknowledgment shall not affect Landlord's rights hereunder. The "**Term**" of this Lease shall be the Base Term, as defined above on the first page of this Lease and any Extension Terms which Tenant may elect pursuant to Section 40 hereof.

Except as set forth in this Lease and the Work Letter: (i) Tenant shall accept the Premises in their condition as of the Commencement Date, subject to all applicable Legal Requirements (as defined in Section 7 hereof); (ii) Landlord shall have no obligation for any defects in the Premises; and (iii) Tenant's taking possession of the Premises shall be conclusive evidence that Tenant accepts the Premises and that the Premises were in good condition at the time possession was taken.

Except as otherwise in this Lease, Tenant agrees and acknowledges that neither Landlord nor any agent of Landlord has made any representation or warranty with respect to the condition of all or any portion of the Premises or the Project, and/or the suitability of the Premises or the Project for the conduct

of Tenant's business, and Tenant waives any implied warranty that the Premises or the Project are suitable for the Permitted Use. This Lease constitutes the complete agreement of Landlord and Tenant with respect to the subject matter hereof and supersedes any and all prior representations, inducements, promises, agreements, understandings and negotiations which are not contained herein. Landlord in executing this Lease does so in reliance upon Tenant's representations, warranties, acknowledgments and agreements contained herein.

3. **Rent**.

(a) **Base Rent**. Base Rent for the month in which the Rent Commencement Date occurs and the Security Deposit shall be due and payable on delivery of an executed copy of this Lease to Landlord. Tenant shall pay to Landlord in advance, without demand, abatement, deduction or set-off, monthly installments of Base Rent on or before the first day of each calendar month during the Term hereof after the Rent Commencement Date, in lawful money of the United States of America, at the office of Landlord for payment of Rent set forth above, or to such other person or at such other place as Landlord may from time to time designate in writing. Payments of Base Rent for any fractional calendar month shall be prorated. The obligation of Tenant to pay Base Rent and other sums to Landlord and the obligations of Landlord under this Lease are independent obligations. Tenant shall have no right at any time to abate, reduce, or set-off any Rent (as defined in Section 5) due hereunder except for any abatement as may be expressly provided in this Lease.

(b) **Additional Rent**. In addition to Base Rent, Tenant agrees to pay to Landlord as additional rent ("**Additional Rent**"): (i) Tenant's Share of "Operating Expenses" (as defined in Section 5), and (ii) any and all other amounts Tenant assumes or agrees to pay under the provisions of this Lease, including, without limitation, any and all other sums that may become due by reason of any default of Tenant or failure to comply with the agreements, terms, covenants and conditions of this Lease to be performed by Tenant, after any applicable notice and cure period.

4. **Base Rent Adjustments**. Base Rent shall be increased on each annual anniversary of the first day of the first full month during the Term of this Lease (each an "**Adjustment Date**") by multiplying the Base Rent payable immediately before such Adjustment Date by the Rent Adjustment Percentage and adding the resulting amount to the Base Rent payable immediately before such Adjustment Date. Base Rent, as so adjusted, shall thereafter be due as provided herein. Base Rent adjustments for any fractional calendar month shall be prorated.

5. **Operating Expense Payments**. Landlord shall deliver to Tenant a written estimate of Operating Expenses for each calendar year during the Term (the "**Annual Estimate**"), which may be revised by Landlord from time to time during such calendar year upon not less than 30 days' written notice to Tenant. Commencing on the Rent Commencement Date and continuing on the first day of each month thereafter during the Term, Tenant shall pay Landlord an amount equal to 1/12th of Tenant's Share of the Annual Estimate. Payments for any fractional calendar month shall be prorated.

The term "**Operating Expenses**" means all costs and expenses of any kind or description whatsoever incurred or accrued each calendar year by Landlord with respect to the Project (including, without duplication, Taxes (as defined in Section 9), reasonable reserves consistent with good business practice for future repairs and replacements, provided that the reserves collected shall not increase by more than 3% per year, capital repairs and improvements amortized over the lesser of 7 years and the useful life of such capital items, and the costs of Landlord's third party property manager or, if there is no third party property manager, administration rent in the amount of 5.0% of Base Rent), excluding only:

(a) the original construction costs of the Project and renovation prior to the date of the Lease and costs of correcting defects in such original construction or renovation;

(b) capital expenditures for expansion of the Project;

(c) interest, principal payments of Mortgage (as defined in Section 27) debts of Landlord, financing costs and amortization of funds borrowed by Landlord, whether secured or unsecured;

(d) depreciation of the Project (except for capital improvements, the cost of which are includable in Operating Expenses);

(e) advertising, legal and space planning expenses and leasing commissions and other costs and expenses incurred in procuring and leasing space to tenants for the Project, including any leasing office maintained in the Project, free rent and construction allowances for tenants;

(f) legal and other expenses incurred in the negotiation or enforcement of leases;

(g) completing, fixturing, improving, renovating, painting, redecorating or other work, which Landlord pays for or performs for other tenants within their premises, and costs of correcting defects in such work;

(h) costs to be reimbursed by other tenants of the Project or Taxes to be paid directly by Tenant or other tenants of the Project, whether or not actually paid;

(i) salaries, wages, benefits and other compensation paid to officers and employees of Landlord who are not assigned in whole or in part to the operation, management, maintenance or repair of the Project;

(j) general organizational, administrative and overhead costs relating to maintaining Landlord's existence, either as a corporation, partnership, or other entity, including general corporate, legal and accounting expenses;

(k) costs (including attorneys' fees and costs of settlement, judgments and payments in lieu thereof) incurred in connection with disputes with tenants, other occupants, or prospective tenants, and costs and expenses, including legal fees, incurred in connection with negotiations or disputes with employees, consultants, management agents, leasing agents, purchasers or mortgagees of the Building;

(I) costs incurred by Landlord due to the violation by Landlord, its employees, agents or contractors or any tenant of the terms and conditions of any lease of space in the Project or any Legal Requirement (as defined in Section 7);

(m) penalties, fines or interest incurred as a result of Landlord's inability or failure to make payment of Taxes and/or to file any tax or informational returns when due, or from Landlord's failure to make any payment of Taxes required to be made by Landlord hereunder before delinquency;

(n) overhead and profit increment paid to Landlord or to subsidiaries or affiliates of Landlord for goods and/or services in or to the Project to the extent the same exceeds the costs of such goods and/or services rendered by unaffiliated third parties on a competitive basis;

(o) costs of Landlord's charitable or political contributions, or of fine art maintained at the Project;

(p) costs in connection with services (including electricity), items or other benefits of a type which are not standard for the Project and which are not available to Tenant without specific charges therefor, but which are provided to another tenant or occupant of the Project, whether or not such other tenant or occupant is specifically charged therefor by Landlord;

(q) costs incurred in the sale or refinancing of the Project;

(r) net income taxes of Landlord or the owner of any interest in the Project, franchise, capital stock, gift, estate or inheritance taxes or any federal, state or local documentary taxes imposed against the Project or any portion thereof or interest therein;

(s) any costs incurred to remove, study, test, remediate or otherwise related to the presence of Hazardous Materials in or about the Building or the Project, which Hazardous Materials Tenant proves (i) existed prior to the Commencement Date, (ii) originated from any separately demised tenant space within the Project other than the Premises or (iii) were not brought upon, kept, used, stored, handled, treated, generated in, or released or disposed of from, the Project by Tenant or any Tenant Party (as herein defined);

(t) the cost of repairs or other work to the extent Landlord is actually reimbursed by insurance or condemnation proceeds; and

(u) any expenses otherwise includable within Operating Expenses to the extent actually reimbursed by persons other than tenants of the Project under leases for space in the Project.

Within 90 days after the end of each calendar year (or such longer period as may be reasonably required), Landlord shall furnish to Tenant a statement (an "**Annual Statement**") showing in reasonable detail: (a) the total and Tenant's Share of actual Operating Expenses for the previous calendar year, and (b) the total of Tenant's payments in respect of Operating Expenses for such year. If Tenant's Share of actual Operating Expenses for such year exceeds Tenant's payments of Operating Expenses for such year, the excess shall be due and payable by Tenant as Rent within 30 days after delivery of such Annual Statement to Tenant. If Tenant's payments of Operating Expenses for such year exceed Tenant's Share of actual Operating Expenses for such year Landlord shall pay the excess to Tenant within 30 days after delivery of such Annual Statement, except that after the expiration, or earlier termination of the Term or if Tenant is delinquent in its obligation to pay Rent, Landlord shall pay the excess to Tenant after deducting all other amounts due Landlord.

The Annual Statement shall be final and binding upon Tenant unless Tenant, within 90 days after Tenant's receipt thereof, shall contest any item therein by giving written notice to Landlord, specifying each item contested and the reason therefor. If, during such 90 day period, Tenant reasonably and in good faith questions or contests the accuracy of Landlord's statement of Tenant's Share of Operating Expenses, Landlord will provide Tenant with access to Landlord's books and records relating to the operation of the Project and such information as Landlord reasonably determines to be responsive to Tenant's questions (the "**Expense Information**"). If after Tenant's review of such Expense Information, Landlord and Tenant cannot agree upon the amount of Tenant's Share of Operating Expenses, then Tenant shall have the right to have an independent regionally recognized public accounting firm selected by Tenant, working pursuant to a fee arrangement other than a contingent fee (at Tenant's sole cost and expense) and approved by Landlord (which approval shall not be unreasonably withheld or delayed), audit and/or review the Expense Information for the year in question (the "**Independent Review**"). The results of any such Independent Review shall be binding on Landlord and Tenant. If the Independent Review shows that the payments actually made by Tenant with respect to Operating Expenses for the calendar year in question exceeded Tenant's Share of Operating Expenses for such calendar year, Landlord shall at Landlord's option either (i) credit the excess amount to the next succeeding installments of estimated Operating Expenses or (ii) pay the excess to Tenant within 30 days after delivery of such statement, except that after the expiration or earlier termination of this Lease or if Tenant is delinquent in its obligation to pay Rent, Landlord shall pay the excess to Tenant after deducting all other amounts due Landlord. If the Independent Review shows that Tenant's payments with respect to Operating Expenses for such calendar year were less than Tenant's Share of Operating Expenses for the calendar year, Tenant shall pay the deficiency to Landlord within 30 days after delivery of such statement. If the Independent Review shows that Tenant has overpaid with respect to Operating Expenses by more than 5% then Landlord shall reimburse Tenant for all costs incurred by Tenant for the Independent Review. Operating Expenses for the calendar years in which Tenant's obligation to share therein begins and ends shall be prorated. Notwithstanding anything set forth herein to the contrary, if the Project is not at least 90% occupied on average during any year of the Term, Tenant's Share of Operating Expenses for such year shall be computed as though the Project had been 90% occupied on average during such year.

"**Tenant's Share**" shall be the percentage set forth on the first page of this Lease as Tenant's Share as reasonably adjusted by Landlord for changes in the physical size of the Premises or the Project occurring thereafter. Landlord may equitably increase Tenant's Share for any item of expense or cost reimbursable by Tenant that relates to a repair, replacement, or service that benefits only the Premises or only a portion of the Project that includes the Premises or that varies with occupancy or use. Base Rent, Tenant's Share of Operating Expenses and all other amounts payable by Tenant to Landlord hereunder are collectively referred to herein as "**Rent**."

6. **Security Deposit**. Tenant shall deposit with Landlord, upon delivery of an executed copy of this Lease to Landlord, a security deposit (the "**Security Deposit**") for the performance of all of Tenant's obligations hereunder in the amount set forth on page 1 of this Lease, which Security Deposit shall be in the form of an unconditional and irrevocable letter of credit (the "**Letter of Credit**"): (i) in form and substance satisfactory to Landlord, (ii) naming Landlord as beneficiary, (iii) expressly allowing Landlord to draw upon it at any time from time to time by delivering to the issuer notice that Landlord is entitled to draw thereunder, (iv) issued by an FDIC-insured financial institution satisfactory to Landlord, and (v) redeemable by presentation of a sight draft in the state of Landlord's choice. If Tenant does not provide Landlord with a substitute Letter of Credit complying with all of the requirements hereof at least 10 days before the stated expiration date of any then current Letter of Credit, Landlord shall have the right to draw the full amount of the current Letter of Credit and hold the funds drawn in cash without obligation for interest thereon as the Security Deposit. The Security Deposit shall be held by Landlord as security for the performance of Tenant's obligations under this Lease. The Security Deposit is not an advance rental deposit or a measure of Landlord's damages in case of Tenant's default. Upon each occurrence of a Default (as defined in Section 20), Landlord may use all or any part of the Security Deposit to pay delinquent payments due under this Lease, future rent damages, and the cost of any damage, injury, expense or liability caused by such Default, without prejudice to any other remedy provided herein or provided by law. Landlord's right to use the Security Deposit under this Section 6 includes the right to use the Security Deposit to pay future rent damages following the termination of this Lease pursuant to Section 21(c) below. Upon any use of all or any portion of the Security Deposit, Tenant shall pay Landlord on demand the amount that will restore the Security Deposit to the amount set forth on Page 1 of this Lease. Tenant hereby waives the provisions of any law, now or hereafter in force, which provide that Landlord may claim from a security deposit only those sums reasonably necessary to remedy defaults in the payment of Rent, to repair damage caused by Tenant or to clean the Premises, it being agreed that Landlord may, in addition, claim those sums reasonably necessary to compensate Landlord for any other loss or damage, foreseeable or unforeseeable, caused by the act or omission of Tenant or any officer, employee, agent or invitee of Tenant. Upon bankruptcy or other debtor-creditor proceedings against Tenant, the Security Deposit shall be deemed to be applied first to the payment of Rent and other charges due Landlord for periods prior to the filing of such proceedings. Upon any such use of all or any portion of the Security Deposit, Tenant shall, within 5 days after demand from Landlord, restore the Security Deposit to its original amount. If Tenant shall fully perform every provision of this Lease to be performed by Tenant, the Security Deposit, or any balance thereof (i.e., after deducting therefrom all amounts to which Landlord is entitled under the provisions of this Lease), shall be returned to Tenant (or, at Landlord's option, to the last assignee of Tenant's interest hereunder) within 90 days after the expiration or earlier termination of this Lease.

If Landlord transfers its interest in the Project or this Lease, Landlord shall either (a) transfer any Security Deposit then held by Landlord to a person or entity assuming Landlord's obligations under this Section 6, or (b) return to Tenant any Security Deposit then held by Landlord and remaining after the deductions permitted herein. Upon such transfer to such transferee or the return of the Security Deposit to Tenant, Landlord shall have no further obligation with respect to the Security Deposit, and Tenant's right to the return of the Security Deposit shall apply solely against Landlord's transferee. The Security Deposit is not an advance rental deposit or a measure of Landlord's damages in case of Tenant's default. Landlord's obligation respecting the Security Deposit is that of a debtor, not a trustee, and no interest shall accrue thereon.

If, as of the expiration of the 36th month of the Base Term (i) Tenant is not in Default of this Lease, and (iii) Tenant has not been in default of this Lease at any time during the Term (collectively, the "**Reduction Requirement**"), then the Security Deposit shall be reduced to an amount equal to 1 month's Base Rent as of the 37th month of the Base Term (the "**Reduced Security Deposit**"). If Tenant has met the Reduction Requirement and delivers a written request to Landlord for such reduction of the Security Deposit, Landlord shall cooperate with Tenant, at no out-of-pocket cost, expense or liability to Landlord, to reduce the Letter of Credit then held by Landlord to the amount of the Reduced Security Deposit. If the Security Deposit is reduced as provided herein, then from and after the date of such reduction, the "**Security Deposit**" shall be deemed to be the Reduced Security Deposit, for all purposes of this Lease.

7. **Use**. The Premises shall be used solely for the Permitted Use set forth in the basic lease provisions on page 1 of this Lease, and in compliance with all laws, orders, judgments, ordinances, regulations, codes, directives, permits, licenses, covenants and restrictions now or hereafter applicable to the Premises, and to the use and occupancy thereof, including, without limitation, the Americans With Disabilities Act, 42 U.S.C. § 12101, et seq. (together with the regulations promulgated pursuant thereto, "**ADA**") (collectively, "**Legal Requirements**" and each, a "**Legal Requirement**"). Tenant shall, upon 5 days' written notice from Landlord, discontinue any use of the Premises which is declared by any Governmental Authority (as defined in Section 9) having jurisdiction to be a violation of a Legal Requirement. Tenant will not use or permit the Premises to be used for any purpose or in any manner that would void Tenant's or Landlord's insurance, increase the insurance risk, or cause the disallowance of any sprinkler or other credits. Tenant shall not permit any part of the Premises to be used as a "place of public accommodation", as defined in the ADA or any similar legal requirement. Tenant shall reimburse Landlord promptly upon demand for any additional premium charged for any such insurance policy by reason of Tenant's failure to comply with the provisions of this Section or otherwise caused by Tenant's use and/or occupancy of the Premises. Tenant will use the Premises in a careful, safe and proper manner and will not commit or permit waste, overload the floor or structure of the Premises, subject the Premises to use that would damage the Premises or obstruct or interfere with the rights of Landlord or other tenants or occupants of the Project, including conducting or giving notice of any auction, liquidation, or going out of business sale on the Premises, or using or allowing the Premises to be used for any unlawful purpose. Tenant shall cause any equipment or machinery to be installed in the Premises so as to reasonably prevent sounds or vibrations from the Premises from extending into Common Areas, or other space in the Project. Tenant shall not place any machinery or equipment which will overload the floor in or upon the Premises or transport or move such items in the Project elevators without the prior written consent of Landlord, which consent shall not be unreasonably withheld. Tenant shall not, without the prior written consent of Landlord, use the Premises in any manner which will require ventilation, air exchange, heating, gas, steam, electricity or water beyond the existing capacity of the Project as proportionately allocated to the Premises based upon Tenant's Share as usually furnished for the Permitted Use.

Landlord shall, at Landlord's sole cost and expense, be responsible for the compliance of the Premises with Legal Requirements, including the ADA, as of the Commencement Date. Tenant, at its sole expense, shall make any alterations or modifications to the interior or the exterior of the Premises or the Project that are required by Legal Requirements (including, without limitation, compliance of the Premises with the ADA) related to Tenant's use or occupancy of the Premises. Notwithstanding any other provision herein to the contrary, Tenant shall be responsible for any and all demands, claims, liabilities, losses, costs, expenses, actions, causes of action, damages or judgments, and all reasonable expenses incurred in investigating or resisting the same (including, without limitation, reasonable attorneys' fees, charges and disbursements and costs of suit) (collectively, "**Claims**") arising out of or in connection with Tenant's failure to comply with any Legal Requirements, and Tenant shall indemnify, defend, hold and save Landlord harmless from and against any and all Claims arising out of or in connection with Tenant's failure to comply with any Legal Requirements.

8. **Holding Over**. If, with Landlord's express written consent, Tenant retains possession of the Premises after the termination of the Term, (i) unless otherwise agreed in such written consent, such possession shall be subject to termination by Landlord at any time upon 30 days notice to Tenant, (ii) all of the other terms and provisions of this Lease (including, without limitation, the adjustment of Base Rent

pursuant to Section 4 hereof) shall remain in full force and effect (excluding any expansion or renewal option or other similar right or option) during such holdover period, (iii) Tenant shall continue to pay Base Rent in the amount payable upon the date of the expiration or earlier termination of this Lease or such other amount as Landlord may indicate, in Landlord's sole and absolute discretion, in such written consent, and (iv) all other payments shall continue under the terms of this Lease. If Tenant remains in possession of the Premises after the expiration or earlier termination of the Term without the express written consent of Landlord, (A) Tenant shall become a tenant at sufferance upon the terms of this Lease except that the monthly rental shall be equal to 150% of Rent in effect during the last 30 days of the Term, and (B) Tenant shall be responsible for all damages suffered by Landlord resulting from or occasioned by Tenant's holding over, including consequential damages. No holding over by Tenant, whether with or without consent of Landlord, shall operate to extend this Lease except as otherwise expressly provided, and this Section 8 shall not be construed as consent for Tenant to retain possession of the Premises. Acceptance by Landlord of Rent after the expiration of the Term or earlier termination of this Lease shall not result in a renewal or reinstatement of this Lease.

9. **Taxes**. Landlord shall pay, as part of Operating Expenses, all taxes, levies, fees, assessments and governmental charges of any kind, existing as of the Commencement Date or thereafter enacted (collectively referred to as "**Taxes**"), imposed by any federal, state, regional, municipal, local or other governmental authority or agency, including, without limitation, quasi-public agencies (collectively, "**Governmental Authority**") during the Term, including, without limitation, all Taxes: (i) imposed on or measured by or based, in whole or in part, on rent payable to (or gross receipts received by) Landlord under this Lease and/or from the rental by Landlord of the Project or any portion thereof, or (ii) based on the square footage, assessed value or other measure or evaluation of any kind of the Premises or the Project, or (iii) assessed or imposed by or on the operation or maintenance of any portion of the Premises or the Project, including parking, or (iv) assessed or imposed by, or at the direction of, or resulting from Legal Requirements, or interpretations thereof, promulgated by any Governmental Authority, or (v) imposed as a license or other fee, charge, tax, or assessment on Landlord's business or occupation of leasing space in the Project. Landlord may contest by appropriate legal proceedings the amount, validity, or application of any Taxes or liens securing Taxes. Taxes shall not include any net income taxes imposed on Landlord except to the extent such net income taxes are in substitution for any Taxes payable hereunder. If any such Tax is levied or assessed directly against Tenant, then Tenant shall be responsible for and shall pay the same at such times and in such manner as the taxing authority shall require. Tenant shall pay, prior to delinquency, any and all Taxes levied or assessed against any personal property or trade fixtures placed by Tenant in the Premises, whether levied or assessed against Landlord or Tenant. If any Taxes on Tenant's personal property or trade fixtures are levied against Landlord or Landlord's property, or if the assessed valuation of the Project is increased by a value attributable to improvements in or alterations to the Premises, whether owned by Landlord or Tenant and whether or not affixed to the real property so as to become a part thereof, higher than the base valuation on which Landlord from time-to-time allocates Taxes to all tenants in the Project, Landlord shall have the right, but not the obligation, to pay such Taxes. Landlord's determination of any excess assessed valuation shall be binding and conclusive, absent manifest error. The amount of any such payment by Landlord shall constitute Additional Rent due from Tenant to Landlord immediately upon demand.

10. **Parking**. Subject to all matters of record, Force Majeure, a Taking (as defined in Section 19 below) and the exercise by Landlord of its rights hereunder, Tenant shall have the right, in common with other tenants of the Project pro rata in accordance with the rentable area of the Premises and the rentable areas of the Project occupied by such other tenants, to park in the non-reserved parking areas serving the Building (provided, however, that in no event shall Tenant be entitled to more than its pro rata share of any particular parking area serving the Building), as may be modified by Landlord from time to time, subject in each case to Landlord's rules and regulations. As of the Commencement Date, Tenant's pro rata share of parking spaces shall be 2 spaces per 1,000 rentable square feet of the Premises (which is equal to 14 spaces). As of the date hereof, there are four separate parking areas for the Building: (i) one parking area includes underground parking under the Building ("**Underground Parking**"); (ii) the second parking area includes above-ground parking adjacent to the Building ("**Surface Parking**"); (iii) the third parking area is a surface parking lot located to the northeast of the Building ("**Northeast Parking**"), (iv) the fourth parking area is a surface parking lot approximately 2 blocks from

the Building (the "**Off-Site Parking**"). Tenant share of parking spaces (i.e., the 2 parking spaces per 1,000 rentable square feet of the Premises) shall be allocated among the Underground Parking, Surface Parking, Northeast Parking and Offsite Parking as follows: 4 reserved parking spaces in the Underground Parking, 2 unreserved parking spaces in the Surface Parking, 0 parking spaces in the Northeast Parking and 8 unreserved parking spaces in the Off-Site Parking. Landlord may allocate parking spaces among Tenant and other tenants in the Project pro rata as described above if Landlord determines that such parking facilities are becoming crowded. Landlord shall not be responsible for enforcing Tenant's parking rights against any third parties, including other tenants of the Project or for enforcing any such reservation of parking spaces.

11. **Utilities, Services**. Landlord shall provide, subject to the terms of this Section 11, water, electricity, heat, light, power, sewer, and other utilities (including gas and fire sprinklers to the extent the Project is plumbed for such services), refuse and trash collection and janitorial services for the Common Areas (collectively, "**Utilities**"). Landlord shall pay, as Operating Expenses or subject to Tenant's reimbursement obligation, for all Utilities used on the Premises, all maintenance charges for Utilities, and any storm sewer charges or other similar charges for Utilities imposed by any Governmental Authority or Utility provider, and any taxes, penalties, surcharges or similar charges thereon. Landlord may cause, at Tenant's expense, any Utilities to be separately metered or charged directly to Tenant by the provider. Tenant shall pay directly to the Utility provider, prior to delinquency, any separately metered Utilities and services which may be furnished to Tenant or the Premises during the Term. Tenant shall pay, as part of Operating Expenses, its share of all charges for jointly metered Utilities based upon consumption, as reasonably determined by Landlord. No interruption or failure of Utilities, from any cause whatsoever other than Landlord's willful misconduct, shall result in eviction or constructive eviction of Tenant, termination of this Lease or the abatement of Rent. Tenant agrees to limit use of water and sewer with respect to Common Areas to normal restroom use.

12. **Alterations and Tenant's Property**. Any alterations, additions, or improvements made to the Premises by or on behalf of Tenant, including additional locks or bolts of any kind or nature upon any doors or windows in the Premises, but excluding installation, removal or realignment of furniture systems (other than removal of furniture systems owned or paid for by Landlord) not involving any modifications to the structure or connections (other then by ordinary plugs or jacks) to Building Systems (as defined in Section 13) ("**Alterations**") shall be subject to Landlord's prior written consent, which may be given or withheld in Landlord's sole discretion if any such Alteration affects the structure or Building Systems and shall not be otherwise unreasonably withheld, conditioned or delayed. Tenant may construct nonstructural Alterations in the Premises without Landlord's prior approval if the aggregate cost of all such work in any 12 month period does not exceed $50,000 (a "**Notice-Only Alteration**"), provided Tenant notifies Landlord in writing of such intended Notice-Only Alteration, and such notice shall be accompanied by plans, specifications, work contracts and such other information concerning the nature and cost of the Notice-Only Alteration as may be reasonably requested by Landlord, which notice and accompanying materials shall be delivered to Landlord not less than 15 business days in advance of any proposed construction. If Landlord approves any Alterations, Landlord may impose such conditions on Tenant in connection with the commencement, performance and completion of such Alterations as Landlord may deem appropriate in Landlord's reasonable discretion. Any request for approval shall be in writing, delivered not less than 15 business days in advance of any proposed construction, and accompanied by plans, specifications, bid proposals, work contracts and such other information concerning the nature and cost of the alterations as may be reasonably requested by Landlord, including the identities and mailing addresses of all persons performing work or supplying materials. Landlord's right to review plans and specifications and to monitor construction shall be solely for its own benefit, and Landlord shall have no duty to ensure that such plans and specifications or construction comply with applicable Legal Requirements. Tenant shall cause, at its sole cost and expense, all Alterations to comply with insurance requirements and with Legal Requirements and shall implement at its sole cost and expense any alteration or modification required by Legal Requirements as a result of any Alterations. Tenant shall pay to Landlord, as Additional Rent, on demand an amount equal to 2.5% of all charges incurred by Tenant or its contractors or agents in connection with any Alteration to cover Landlord's overhead and expenses for plan review, coordination, scheduling and supervision. Before Tenant begins any Alteration, Landlord may post on and about the Premises notices of non-responsibility pursuant to

applicable law. Tenant shall reimburse Landlord for, and indemnify and hold Landlord harmless from, any expense incurred by Landlord by reason of faulty work done by Tenant or its contractors, delays caused by such work, or inadequate cleanup.

Tenant shall furnish security or make other arrangements satisfactory to Landlord to assure payment for the completion of all Alterations work free and clear of liens, and shall provide (and cause each contractor or subcontractor to provide) certificates of insurance for workers' compensation and other coverage in amounts and from an insurance company satisfactory to Landlord protecting Landlord against liability for personal injury or property damage during construction. Upon completion of any Alterations, Tenant shall deliver to Landlord: (i) sworn statements setting forth the names of all contractors and subcontractors who did the work and final lien waivers from all such contractors and subcontractors; and (ii) "as built" plans for any such Alteration.

Except for Removable Installations (as hereinafter defined), all Installations (as hereinafter defined) shall be and shall remain the property of Landlord during the Term and following the expiration or earlier termination of the Term, shall not be removed by Tenant at any time during the Term, and shall remain upon and be surrendered with the Premises as a part thereof. Notwithstanding the foregoing, Landlord may, at the time its approval of any such Installation is requested, or at the time it receives notice of a Notice Only Alteration, notify Tenant that Landlord requires that Tenant remove such Installation upon the expiration or earlier termination of the Term, in which event Tenant shall remove such installation in accordance with the immediately succeeding sentence. Upon the expiration or earlier termination of the Term, Tenant shall remove (i) all wires, cables or similar equipment which Tenant has installed in the Premises or in the risers or plenums of the Building, (ii) any Installations for which Landlord has given Tenant notice of removal in accordance with the immediately preceding sentence, and (iii) all of Tenant's Property (as hereinafter defined), and Tenant shall restore and repair any damage caused by or occasioned as a result of such removal, including, without limitation, capping off all such connections behind the walls of the Premises and repairing any holes. During any restoration period beyond the expiration or earlier termination of the Term, Tenant shall pay Rent to Landlord as provided herein as if said space were otherwise occupied by Tenant. If Landlord is requested by Tenant or any lender, lessor or other person or entity claiming an interest in any of Tenant's Property to waive any lien Landlord may have against any of Tenant's Property, and Landlord consents to such waiver, then Landlord shall be entitled to be paid as administrative rent a fee of $1,000 per occurrence for its time and effort in preparing and negotiating such a waiver of lien. Notwithstanding anything to the contrary contained herein, in no event shall Tenant be required to remove the Tenant Improvements at the expiration or earlier termination of the Term.

For purposes of this Lease, (x) "**Removable Installations**" means any items listed on Exhibit F attached hereto and any items agreed by Landlord in writing to be included on **Exhibit F** in the future, (y) "**Tenant's Property**" means Removable Installations and, other than Installations, any personal property or equipment of Tenant that may be removed without material damage to the Premises, and (z) "**Installations**" means all property of any kind paid for with by Landlord, all Alterations, all fixtures, and all partitions, hardware, built-in machinery, built-in casework and cabinets and other similar additions, equipment, property and improvements built into the Premises so as to become an integral part of the Premises, including, without limitation, fume hoods which penetrate the roof or plenum area, built-in cold rooms, built-in warm rooms, walk-in cold rooms, walk-in warm rooms, deionized water systems, glass washing equipment, autoclaves, chillers, built-in plumbing, electrical and mechanical equipment and systems, and any power generator and transfer switch.

13. **Landlord's Repairs**. Landlord, as an Operating Expense, shall maintain all of the structural, exterior, parking and other Common Areas of the Project, including HVAC, plumbing, fire sprinklers, elevators and all other building systems serving the Premises and other portions of the Project ("**Building Systems**"), in good repair, reasonable wear and tear and uninsured losses and damages caused by Tenant, or by any of Tenant's agents, servants, employees, invitees and contractors (collectively, "**Tenant Parties**") excluded. Losses and damages caused by Tenant or any Tenant Party shall be repaired by Landlord, to the extent not covered by insurance, at Tenant's sole cost and expense. Landlord reserves the right to stop Building Systems services when necessary (i) by reason of accident or

emergency, or (ii) for planned repairs, alterations or improvements, which are, in the judgment of Landlord, desirable or necessary to be made, until said repairs, alterations or improvements shall have been completed. Landlord shall have no responsibility or liability for failure to supply Building Systems services during any such period of interruption; provided, however, that Landlord shall, except in case of emergency, make a commercially reasonable effort to give Tenant 24 hours advance notice of any planned stoppage of Building Systems services for routine maintenance, repairs, alterations or improvements. Tenant shall promptly give Landlord written notice of any repair required by Landlord pursuant to this Section, after which Landlord shall make a commercially reasonable effort to effect such repair. Landlord shall not be liable for any failure to make any repairs or to perform any maintenance unless such failure shall persist for an unreasonable time after Tenant's written notice of the need for such repairs or maintenance. Tenant waives its rights under any state or local law to terminate this Lease or to make such repairs at Landlord's expense and agrees that the parties' respective rights with respect to such matters shall be solely as set forth herein. Repairs required as the result of fire, earthquake, flood, vandalism, war, or similar cause of damage or destruction shall be controlled by Section 18.

14. **Tenant's Repairs**. Subject to Section 13 hereof, Tenant, at its expense, shall repair, replace and maintain in good condition all portions of the Premises, including, without limitation, entries, doors, ceilings, interior windows, interior walls, and the interior side of demising walls. Should Tenant fail to make any such repair or replacement or fail to maintain the Premises, Landlord shall give Tenant notice of such failure. If Tenant fails to commence cure of such failure within 10 days of Landlord's notice, and thereafter diligently prosecute such cure to completion, Landlord may perform such work and shall be reimbursed by Tenant within 10 days after demand therefor; provided, however, that if such failure by Tenant creates or could create an emergency, Landlord may immediately commence cure of such failure and shall thereafter be entitled to recover the costs of such cure from Tenant. Subject to Sections 17 and 18, Tenant shall bear the full uninsured cost of any repair or replacement to any part of the Project that results from damage caused by Tenant or any Tenant Party and any repair that benefits only the Premises.

15. **Mechanic's Liens**. Tenant shall discharge, by bond or otherwise, any mechanic's lien filed against the Premises or against the Project for work claimed to have been done for, or materials claimed to have been furnished to, Tenant within 10 days after the filing thereof, at Tenant's sole cost and shall otherwise keep the Premises and the Project free from any liens arising out of work performed, materials furnished or obligations incurred by Tenant. Should Tenant fail to discharge any lien described herein, Landlord shall have the right, but not the obligation, to pay such claim or post a bond or otherwise provide security to eliminate the lien as a claim against title to the Project and the cost thereof shall be immediately due from Tenant as Additional Rent. If Tenant shall lease or finance the acquisition of office equipment, furnishings, or other personal property of a removable nature utilized by Tenant in the operation of Tenant's business, Tenant warrants that any Uniform Commercial Code Financing Statement filed as a matter of public record by any lessor or creditor of Tenant will upon its face or by exhibit thereto indicate that such Financing Statement is applicable only to removable personal property of Tenant located within the Premises. In no event shall the address of the Project be furnished on the statement without qualifying language as to applicability of the lien only to removable personal property, located in an identified suite held by Tenant.

16. **Indemnification**. Tenant hereby indemnifies and agrees to defend, save and hold Landlord harmless from and against any and Claims for injury or death to persons or damage to property occurring within or about the Premises, arising directly or indirectly out of use or occupancy of the Premises or a breach or default by Tenant in the performance of any of its obligations hereunder, except to the extent caused by the willful misconduct or gross negligence of Landlord. Landlord shall not be liable to Tenant for, and Tenant assumes all risk of damage to, personal property (including, without limitation, loss of records kept within the Premises). Tenant further waives any and all Claims for injury to Tenant's business or loss of income relating to any such damage or destruction of personal property (including, without limitation, any loss of records). Landlord shall not be liable for any damages arising from any act, omission or neglect of any tenant in the Project or of any other third party.

17. **Insurance**. Landlord shall maintain all risk property and, if applicable, sprinkler damage insurance covering the full replacement cost of the Project or such lesser coverage amount as Landlord may elect provided such coverage amount is not less than 90% of such full replacement cost. Landlord shall further procure and maintain commercial general liability insurance with a single loss limit of not less than $2,000,000 for bodily injury and property damage with respect to the Project. Landlord may, but is not obligated to, maintain such other insurance and additional coverages as it may deem necessary, including, but not limited to, flood, environmental hazard and earthquake, loss or failure of building equipment, errors and omissions, rental loss during the period of repair or rebuilding, workers' compensation insurance and fidelity bonds for employees employed to perform services and insurance for any improvements installed by Tenant or which are in addition to the standard improvements customarily furnished by Landlord without regard to whether or not such are made a part of the Project. All such insurance shall be included as part of the Operating Expenses. The Project may be included in a blanket policy (in which case the cost of such insurance allocable to the Project will be determined by Landlord based upon the insurer's cost calculations).

Tenant, at its sole cost and expense, shall maintain during the Term: special form or all risk property insurance with business interruption and extra expense coverage, covering the full replacement cost of all property and improvements installed or placed in the Premises by Tenant at Tenant's expense; workers' compensation insurance with no less than the minimum limits required by law; employer's liability insurance with such limits as required by law; and commercial general liability insurance, with a minimum limit of not less than $2,000,000 per occurrence for bodily injury and property damage with respect to the Premises. The commercial general liability insurance policy shall name Alexandria Real Estate Equities, Inc., and Landlord, its officers, directors, employees, managers, agents, invitees and contractors (collectively, "**Landlord Parties**"), as additional insureds; insure on an occurrence and not a claims-made basis; be issued by insurance companies which have a rating of not less than policyholder rating of A and financial category rating of at least Class X in "Best's Insurance Guide"; shall not be cancelable for nonpayment of premium unless 30 days prior written notice shall have been given to Landlord from the insurer; contain a hostile fire endorsement and a contractual liability endorsement; and provide primary coverage to Landlord (any policy issued to Landlord providing duplicate or similar coverage shall be deemed excess over Tenant's policies). Copies of such policies (if requested by Landlord), or certificates of insurance showing the limits of coverage required hereunder and showing Landlord as an additional insured, along with reasonable evidence of the payment of premiums for the applicable period, shall be delivered to Landlord by Tenant upon commencement of the Term and upon each renewal of said insurance. Tenant's policy may be a "blanket policy" with an aggregate per location endorsement which specifically provides that the amount of insurance shall not be prejudiced by other losses covered by the policy. Tenant shall, at least 5 days prior to the expiration of such policies, furnish Landlord with renewal certificates.

In each instance where insurance is to name Landlord as an additional insured, Tenant shall upon written request of Landlord also designate and furnish certificates so evidencing Landlord as additional insured to: (i) any lender of Landlord holding a security interest in the Project or any portion thereof, (ii) the landlord under any lease wherein Landlord is tenant of the real property on which the Project is located, if the interest of Landlord is or shall become that of a tenant under a ground or other underlying lease rather than that of a fee owner, and/or (iii) any management company retained by Landlord to manage the Project.

The property insurance obtained by Landlord and Tenant shall include a waiver of subrogation by the insurers and all rights based upon an assignment from its insured, against Landlord or Tenant, and their respective officers, directors, employees, managers, agents, invitees and contractors ("**Related Parties**"), in connection with any loss or damage thereby insured against. Neither party nor its respective Related Parties shall be liable to the other for loss or damage caused by any risk insured against under property insurance required to be maintained hereunder, and each party waives any claims against the other party, and its respective Related Parties, for such loss or damage. The failure of a party to insure its property shall not void this waiver. Landlord and its respective Related Parties shall not be liable for, and Tenant hereby waives all claims against such parties for, business interruption and losses occasioned thereby sustained by Tenant or any person claiming through Tenant resulting from any

accident or occurrence in or upon the Premises or the Project from any cause whatsoever. If the foregoing waivers shall contravene any law with respect to exculpatory agreements, the liability of Landlord or Tenant shall be deemed not released but shall be secondary to the other's insurer.

Landlord may require insurance policy limits to be raised to conform with requirements of Landlord's lender and/or to bring coverage limits to levels then being generally required of new tenants within the Project.

18. **Restoration**. If, at any time during the Term, the Project or the Premises are damaged or destroyed by a fire or other insured casualty, Landlord shall notify Tenant within 60 days after discovery of such damage as to the amount of time Landlord reasonably estimates it will take to restore the Project or the Premises, as applicable (the "**Restoration Period**"). If the Restoration Period is estimated to exceed 12 months (the "**Maximum Restoration Period**"), Landlord may, in such notice, elect to terminate this Lease as of the date that is 75 days after the date of discovery of such damage or destruction; provided, however, that notwithstanding Landlord's election to restore, Tenant may elect to terminate this Lease by written notice to Landlord delivered within 10 business days of receipt of a notice from Landlord estimating a Restoration Period for the Premises longer than the Maximum Restoration Period. Unless either Landlord or Tenant so elects to terminate this Lease, Landlord shall, subject to receipt of sufficient insurance proceeds (with any deductible to be treated as a current Operating Expense), promptly restore the Premises (excluding the improvements installed by Tenant or by Landlord and paid for by Tenant), subject to delays arising from the collection of insurance proceeds, from Force Majeure events or as needed to obtain any license, clearance or other authorization of any kind required to enter into and restore the Premises issued by any Governmental Authority having jurisdiction over the use, storage, handling, treatment, generation, release, disposal, removal or remediation of Hazardous Materials (as defined in Section 30) in, on or about the Premises (collectively referred to herein as "**Hazardous Materials Clearances**"); provided, however, that if repair or restoration of the Premises is not substantially complete as of the end of the Maximum Restoration Period or, if longer, the Restoration Period, Landlord may, in its sole and absolute discretion, elect not to proceed with such repair and restoration, in which event Landlord shall be relieved of its obligation to make such repairs or restoration and this Lease shall terminate as of the date that is 75 days after the later of: (i) discovery of such damage or destruction, or (ii) the date all required Hazardous Materials Clearances are obtained, but Landlord shall retain any Rent paid and the right to any Rent payable by Tenant prior to such election by Landlord or Tenant.

Tenant, at its expense, shall promptly perform, subject to delays arising from the collection of insurance proceeds, from Force Majeure (as defined in Section 34) events or to obtain Hazardous Material Clearances, all repairs or restoration not required to be done by Landlord and shall promptly re-enter the Premises and commence doing business in accordance with this Lease. Notwithstanding the foregoing, either Landlord or Tenant may terminate this Lease upon written notice to the other if the Premises are damaged during the last year of the Term and Landlord reasonably estimates that it will take more than 2 months to repair such damage; provided, however, that such notice is delivered within 10 business days after the date that Landlord provides Tenant with written notice of the estimated Restoration Period. Landlord shall also have the right to terminate this Lease if insurance proceeds are not available for such restoration. Rent shall be abated from the date all required Hazardous Material Clearances are obtained until the Premises are repaired and restored, in the proportion which the area of the Premises, if any, which is not usable by Tenant bears to the total area of the Premises, unless Landlord provides Tenant with other space during the period of repair that is suitable for the temporary conduct of Tenant's business. Such abatement shall be the sole remedy of Tenant, and except as provided in this Section 18, Tenant waives any right to terminate the Lease by reason of damage or casualty loss.

The provisions of this Lease, including this Section 18, constitute an express agreement between Landlord and Tenant with respect to any and all damage to, or destruction of, all or any part of the Premises, or any other portion of the Project, and any statute or regulation which is now or may hereafter be in effect shall have no application to this Lease or any damage or destruction to all or any part of the Premises or any other portion of the Project, the parties hereto expressly agreeing that this Section 18 sets forth their entire understanding and agreement with respect to such matters.

19. **Condemnation**. If the whole or any material part of the Premises or the Project is taken for any public or quasi-public use under governmental law, ordinance, or regulation, or by right of eminent domain, or by private purchase in lieu thereof (a "**Taking**" or "**Taken**"), and the Taking would in Landlord's reasonable judgment, either prevent or materially interfere with Tenant's use of the Premises or materially interfere with or impair Landlord's ownership or operation of the Project, then upon written notice by Landlord this Lease shall terminate and Rent shall be apportioned as of said date. If part of the Premises shall be Taken, and this Lease is not terminated as provided above, Landlord shall promptly restore the Premises and the Project as nearly as is commercially reasonable under the circumstances to their condition prior to such partial Taking and the rentable square footage of the Building, the rentable square footage of the Premises, Tenant's Share of Operating Expenses and the Rent payable hereunder during the unexpired Term shall be reduced to such extent as may be fair and reasonable under the circumstances. Upon any such Taking, Landlord shall be entitled to receive the entire price or award from any such Taking without any payment to Tenant, and Tenant hereby assigns to Landlord Tenant's interest, if any, in such award. Tenant shall have the right, to the extent that same shall not diminish Landlord's award, to make a separate claim against the condemning authority (but not Landlord) for such compensation as may be separately awarded or recoverable by Tenant for moving expenses and damage to Tenant's trade fixtures, if a separate award for such items is made to Tenant. Tenant hereby waives any and all rights it might otherwise have pursuant to any provision of state law to terminate this Lease upon a partial Taking of the Premises or the Project.

20. **Events of Default**. Each of the following events shall be a default ("**Default**") by Tenant under this Lease:

(a) **Payment Defaults**. Tenant shall fail to pay any installment of Rent or any other payment hereunder when due; provided, however, that Landlord will give Tenant notice and an opportunity to cure any failure to pay Rent within 3 days of any such notice not more than once in any 12 month period.

(b) **Insurance**. Any insurance required to be maintained by Tenant pursuant to this Lease shall be canceled or terminated or shall expire or shall be reduced or materially changed, or Landlord shall receive a notice of nonrenewal of any such insurance and Tenant shall fail to obtain replacement insurance before the expiration of the current coverage.

(c) **Abandonment**. Tenant shall abandon the Premises.

(d) **Improper Transfer**. Tenant shall assign, sublease or otherwise transfer or attempt to transfer all or any portion of Tenant's interest in this Lease or the Premises except as expressly permitted herein, or Tenant's interest in this Lease shall be attached, executed upon, or otherwise judicially seized and such action is not released within 90 days of the action.

(e) **Liens**. Tenant shall fail to discharge or otherwise obtain the release of any lien placed upon the Premises in violation of this Lease within 10 days after any such lien is filed against the Premises.

(f) **Insolvency Events**. Tenant or any guarantor or surety of Tenant's obligations hereunder shall: (A) make a general assignment for the benefit of creditors; (B) commence any case, proceeding or other action seeking to have an order for relief entered on its behalf as a debtor or to adjudicate it a bankrupt or insolvent, or seeking reorganization, arrangement, adjustment, liquidation, dissolution or composition of it or its debts or seeking appointment of a receiver, trustee, custodian or other similar official for it or for all or of any substantial part of its property (collectively a "**Proceeding for Relief**"); (C) become the subject of any Proceeding for Relief which is not dismissed within 90 days of its filing or entry; or (D) die or suffer a legal disability (if Tenant, guarantor, or surety is an individual) or be dissolved or otherwise fail to maintain its legal existence (if Tenant, guarantor or surety is a corporation, partnership or other entity).

(g) **Estoppel Certificate or Subordination Agreement**. Tenant fails to execute any document required from Tenant under Sections 23 or 27 within 5 days after a second notice requesting such document.

(h) **Other Defaults**. Tenant shall fail to comply with any provision of this Lease other than those specifically referred to in this Section 20, and, except as otherwise expressly provided herein, such failure shall continue for a period of 10 days after written notice thereof from Landlord to Tenant; provided that if the nature of Tenant's default pursuant to this Section 20(h) is such that it cannot be cured by the payment of money and reasonably requires more than 10 days to cure, then Tenant shall not be deemed to be in default if Tenant commences such cure within said 10 day period and thereafter diligently prosecutes the same to completion; provided, however, that such cure shall be completed no later than 60 days from the date of Landlord's notice, as such time period may be extended for Force Majeure delays

Any notice given under Section 20(h) hereof shall: (i) specify the alleged default, (ii) demand that Tenant cure such default, (iii) be in lieu of, and not in addition to, or shall be deemed to be, any notice required under any provision of applicable law, and (iv) not be deemed a forfeiture or a termination of this Lease unless Landlord elects otherwise in such notice; provided that if the nature of Tenant's default pursuant to Section 20(h) is such that it cannot be cured by the payment of money and reasonably requires more than 10 days to cure, then Tenant shall not be deemed to be in default if Tenant commences such cure within said 10 day period and thereafter diligently prosecutes the same to completion; provided, however, that such cure shall be completed no later than 60 days from the date of Landlord's notice.

21. **Landlord's Remedies**.

(a) **Payment By Landlord; Interest**. Upon a Default by Tenant hereunder, Landlord may, without waiving or releasing any obligation of Tenant hereunder, make such payment or perform such act. All sums so paid or incurred by Landlord, together with interest thereon, from the date such sums were paid or incurred, at the annual rate equal to 12% per annum or the highest rate permitted by law (the "**Default Rate**"), whichever is less, shall be payable to Landlord on demand as Additional Rent. Nothing herein shall be construed to create or impose a duty on Landlord to mitigate any damages resulting from Tenant's Default hereunder.

(b) **Late Payment Rent**. Late payment by Tenant to Landlord of Rent and other sums due will cause Landlord to incur costs not contemplated by this Lease, the exact amount of which will be extremely difficult and impracticable to ascertain. Such costs include, but are not limited to, processing and accounting charges and late charges which may be imposed on Landlord under any Mortgage covering the Premises. Therefore, if any installment of Rent due from Tenant is not received by Landlord within 5 days after the date such payment is due, Tenant shall pay to Landlord an additional sum equal to 6% of the overdue Rent as a late charge. The parties agree that this late charge represents a fair and reasonable estimate of the costs Landlord will incur by reason of late payment by Tenant. In addition to the late charge, Rent not paid when due shall bear interest at the Default Rate from the 5th day after the date due until paid.

(c) **Remedies**. Upon the occurrence of a Default, Landlord, at its option, without further notice or demand to Tenant, shall have in addition to all other rights and remedies provided in this Lease, at law or in equity, the option to pursue any one or more of the following remedies, each and all of which shall be cumulative and nonexclusive, without any notice or demand whatsoever.

(i) Terminate this Lease, or at Landlord's option, Tenant's right to possession only, in which event Tenant shall immediately surrender the Premises to Landlord, and if Tenant fails to do so, Landlord may, without prejudice to any other remedy which it may have for possession or

arrearages in rent, enter upon and take possession of the Premises and expel or remove Tenant and any other person who may be occupying the Premises or any part thereof, without being liable for prosecution or any claim or damages therefor;

(ii) Upon any termination of this Lease, whether pursuant to the foregoing Section 21(c)(i) or otherwise, Landlord may recover from Tenant the following:

(A) The worth at the time of award of any unpaid rent which has been earned at the time of such termination; plus

(B) The worth at the time of award of the amount by which the unpaid rent which would have been earned after termination until the time of award exceeds the amount of such rental loss that Tenant proves could have been reasonably avoided; plus

(C) The worth at the time of award of the amount by which the unpaid rent for the balance of the Term after the time of award exceeds the amount of such rental loss that Tenant proves could have been reasonably avoided; plus

(D) Any other amount necessary to compensate Landlord for all the detriment proximately caused by Tenant's failure to perform its obligations under this Lease or which in the ordinary course of things would be likely to result therefrom, specifically including, but not limited to, brokerage commissions and advertising expenses incurred, expenses of remodeling the Premises or any portion thereof for a new tenant, whether for the same or a different use, and any special concessions made to obtain a new tenant; and

(E) At Landlord's election, such other amounts in addition to or in lieu of the foregoing as may be permitted from time to time by applicable law.

The term "**rent**" as used in this Section 21 shall be deemed to be and to mean all sums of every nature required to be paid by Tenant pursuant to the terms of this Lease, whether to Landlord or to others. As used in Sections 21(c)(ii)(A) and (B), above, the "**worth at the time of award**" shall be computed by allowing interest at the Default Rate. As used in Section 21(c)(ii)(C) above, the "**worth at the time of award**" shall be computed by discounting such amount at the discount rate of the Federal Reserve Bank of San Francisco at the time of award plus 1%.

(iii) Landlord may continue this Lease in effect after Tenant's Default and recover rent as it becomes due (Landlord and Tenant hereby agreeing that Tenant has the right to sublet or assign hereunder, subject only to reasonable limitations). Accordingly, if Landlord does not elect to terminate this Lease following a Default by Tenant, Landlord may, from time to time, without terminating this Lease, enforce all of its rights and remedies hereunder, including the right to recover all Rent as it becomes due.

(iv) Whether or not Landlord elects to terminate this Lease following a Default by Tenant, Landlord shall have the right to terminate any and all subleases, licenses, concessions or other consensual arrangements for possession entered into by Tenant and affecting the Premises or may, in Landlord's sole discretion, succeed to Tenant's interest in such subleases, licenses, concessions or arrangements. Upon Landlord's election to succeed to Tenant's interest in any such subleases, licenses, concessions or arrangements, Tenant shall, as of the date of notice by Landlord of such election, have no further right to or interest in the rent or other consideration receivable thereunder.

(v) Independent of the exercise of any other remedy of Landlord hereunder or under applicable law, Landlord may conduct an environmental test of the Premises as generally described in Section 30(c) hereof, at Tenant's expense.

(d) **Effect of Exercise**. Exercise by Landlord of any remedies hereunder or otherwise available shall not be deemed to be an acceptance of surrender of the Premises and/or a termination of this Lease by Landlord, it being understood that such surrender and/or termination can be effected only by the express written agreement of Landlord and Tenant. Any law, usage, or custom to the contrary notwithstanding, Landlord shall have the right at all times to enforce the provisions of this Lease in strict accordance with the terms hereof; and the failure of Landlord at any time to enforce its rights under this Lease strictly in accordance with same shall not be construed as having created a custom in any way or manner contrary to the specific terms, provisions, and covenants of this Lease or as having modified the same and shall not be deemed a waiver of Landlord's right to enforce one or more of its rights in connection with any subsequent default. A receipt by Landlord of Rent or other payment with knowledge of the breach of any covenant hereof shall not be deemed a waiver of such breach, and no waiver by Landlord of any provision of this Lease shall be deemed to have been made unless expressed in writing and signed by Landlord. To the greatest extent permitted by law, Tenant waives the service of notice of Landlord's intention to re-enter, re-take or otherwise obtain possession of the Premises as provided in any statute, or to institute legal proceedings to that end, and also waives all right of redemption in case Tenant shall be dispossessed by a judgment or by warrant of any court or judge. Any reletting of the Premises or any portion thereof shall be on such terms and conditions as Landlord in its sole discretion may determine. Landlord shall not be liable for, nor shall Tenant's obligations hereunder be diminished because of, Landlord's failure to relet the Premises or collect rent due in respect of such reletting or otherwise to mitigate any damages arising by reason of Tenant's Default.

22. **Assignment and Subletting**.

(a) **General Prohibition**. Without Landlord's prior written consent subject to and on the conditions described in this Section 22, Tenant shall not, directly or indirectly, voluntarily or by operation of law, assign this Lease or sublease the Premises or any part thereof or mortgage, pledge, or hypothecate its leasehold interest or grant any concession or license within the Premises, and any attempt to do any of the foregoing shall be void and of no effect. If Tenant is a corporation, partnership or limited liability company, the shares or other ownership interests thereof which are not actively traded upon a stock exchange or in the over-the-counter market, a transfer or series of transfers whereby 50% or more of the issued and outstanding shares or other ownership interests of such corporation are, or voting control is, transferred (but excepting transfers upon deaths of individual owners) from a person or persons or entity or entities which were owners thereof at time of execution of this Lease to persons or entities who were not owners of shares or other ownership interests of the corporation, partnership or limited liability company at time of execution of this Lease, shall be deemed an assignment of this Lease requiring the consent of Landlord as provided in this Section 22.

(b) **Permitted Transfers**. If Tenant desires to assign, sublease, hypothecate or otherwise transfer this Lease or sublet the Premises, then at least 15 business days, but not more than 90 business days, before the date Tenant desires the assignment or sublease to be effective (the "**Assignment Date**"), Tenant shall give Landlord a notice (the "**Assignment Notice**") containing such information about the proposed assignee or sublessee, including the proposed use of the Premises and any Hazardous Materials proposed to be used, stored handled, treated, generated in or released or disposed of from the Premises, the Assignment Date, any relationship between Tenant and the proposed assignee or sublessee, and all material terms and conditions of the proposed assignment or sublease, including a copy of any proposed assignment or sublease in its final form, and such other information as Landlord may deem reasonably necessary or appropriate to its consideration whether to grant its consent. Landlord may, by giving written notice to Tenant within 15 business days after receipt of the Assignment Notice: (i) grant such consent, (ii) refuse such consent, in its reasonable discretion; or (iii) terminate this Lease with respect to the space described in the Assignment Notice as of the Assignment Date (an "**Assignment Termination**"). Among other reasons, it shall be reasonable for Landlord to withhold its consent in any of these instances: (1) the proposed assignee or subtenant is a governmental agency; (2) in Landlord's reasonable judgment, the use of the Premises by the proposed assignee or subtenant would entail any alterations that would lessen the value of the leasehold improvements in the Premises, or would require increased services by Landlord; (3) in Landlord's good faith reasonable judgment, the proposed assignee or subtenant is engaged in areas of scientific research or other business concerns

that are controversial such that they may (i) attract or cause negative publicity for or about the Building or the Project, (ii) negatively affect the reputation of the Building, the Project or Landlord, (iii) attract protestors to the Building or the Project, or (iv) lessen the attractiveness of the Building or the Project to any tenants or prospective tenants, purchasers or lenders; (4) in Landlord's reasonable judgment, the proposed assignee or subtenant lacks the creditworthiness to support the financial obligations it will incur under the proposed assignment or sublease; (5) in Landlord's reasonable judgment, the character, reputation, or business of the proposed assignee or subtenant is inconsistent with the desired tenant-mix in that its use differs from the Permitted Use or the quality of other tenancies in the Project or is inconsistent with the type and quality of the nature of the Building; (6) Landlord has received from any prior landlord to the proposed assignee or subtenant a negative report concerning such prior landlord's experience with the proposed assignee or subtenant; (7) Landlord has experienced previous defaults by or is in litigation with the proposed assignee or subtenant; (8) the use of the Premises by the proposed assignee or subtenant will violate any applicable Legal Requirement; (9) the proposed assignee or subtenant, or any entity that, directly or indirectly, controls, is controlled by, or is under common control with the proposed assignee or subtenant, is then an occupant of the Project; (10) the proposed assignee or subtenant is an entity with whom Landlord is negotiating to lease space in the Project; or (11) the assignment or sublease is prohibited by Landlord's lender. If Landlord delivers notice of its election to exercise an Assignment Termination, Tenant shall have the right to withdraw such Assignment Notice by written notice to Landlord of such election within 7 business days after Landlord's notice electing to exercise the Assignment Termination. If Tenant withdraws such Assignment Notice, this Lease shall continue in full force and effect. If Tenant does not withdraw such Assignment Notice, this Lease, and the term and estate herein granted, shall terminate as of the Assignment Date with respect to the space described in such Assignment Notice. No failure of Landlord to exercise any such option to terminate this Lease, or to deliver a timely notice in response to the Assignment Notice, shall be deemed to be Landlord's consent to the proposed assignment, sublease or other transfer. Tenant shall pay to Landlord a fee equal to One Thousand Five Hundred Dollars ($1,500) in connection with its consideration of any Assignment Notice and/or its preparation or review of any consent documents. Notwithstanding the foregoing, Landlord's consent to an assignment of this Lease or a subletting of any portion of the Premises to any entity controlling, controlled by or under common control with Tenant (a "**Control Permitted Assignment**") shall not be required, provided that Landlord shall have the right to approve the form of any such sublease or assignment. In addition, Tenant shall have the right to assign this Lease, upon 30 days prior written notice to Landlord but without obtaining Landlord's prior written consent, to a corporation or other entity which is a successor-in-interest to Tenant, by way of merger, consolidation or corporate reorganization, or by the purchase of all or substantially all of the assets or the ownership interests of Tenant provided that (i) such merger or consolidation, or such acquisition or assumption, as the case may be, is for a good business purpose and not principally for the purpose of transferring the Lease, and (ii) the net worth (as determined in accordance with generally accepted accounting principles ("**GAAP**")) of the assignee is not less than the greater of the net worth (as determined in accordance with GAAP) of Tenant as of (A) the Commencement Date, or (B) as of the date of Tenant's most current quarterly or annual financial statements, and (iii) such assignee shall agree in writing to assume all of the terms, covenants and conditions of this Lease arising after the effective date of the assignment (a "**Corporate Permitted Assignment**"). Control Permitted Assignments and Corporate Permitted Assignments are hereinafter referred to as "**Permitted Assignments**."

(c) **Additional Conditions**. As a condition to any such assignment or subletting, whether or not Landlord's consent is required, Landlord may require:

(i) that any assignee or subtenant agree, in writing at the time of such assignment or subletting, that if Landlord gives such party notice that Tenant is in default under this Lease, such party shall thereafter make all payments otherwise due Tenant directly to Landlord, which payments will be received by Landlord without any liability except to credit such payment against those due under the Lease, and any such third party shall agree to attorn to Landlord or its successors and assigns should this Lease be terminated for any reason; provided, however, in no event shall Landlord or its successors or assigns be obligated to accept such attornment; and

(ii) A list of Hazardous Materials, certified by the proposed assignee or sublessee to be true and correct, which the proposed assignee or sublessee intends to use, store, handle, treat, generate in or release or dispose of from the Premises, together with copies of all documents relating to such use, storage, handling, treatment, generation, release or disposal of Hazardous Materials by the proposed assignee or subtenant in the Premises or on the Project, prior to the proposed assignment or subletting, including, without limitation: permits; approvals; reports and correspondence; storage and management plans; plans relating to the installation of any storage tanks to be installed in or under the Project (provided, said installation of tanks shall only be permitted after Landlord has given its written consent to do so, which consent may be withheld in Landlord's sole and absolute discretion); and all closure plans or any other documents required by any and all federal, state and local Governmental Authorities for any storage tanks installed in, on or under the Project for the closure of any such tanks. Neither Tenant nor any such proposed assignee or subtenant is required, however, to provide Landlord with any portion(s) of the such documents containing information of a proprietary nature which, in and of themselves, do not contain a reference to any Hazardous Materials or hazardous activities.

(d) **No Release of Tenant, Sharing of Excess Rents**. Notwithstanding any assignment or subletting, Tenant and any guarantor or surety of Tenant's obligations under this Lease shall at all times remain fully and primarily responsible and liable for the payment of Rent and for compliance with all of Tenant's other obligations under this Lease. If the Rent due and payable by a sublessee or assignee (or a combination of the rental payable under such sublease or assignment plus any bonus or other consideration therefor or incident thereto in any form) exceed the sum of the rental payable under this Lease, (excluding however, any Rent payable under this Section) and actual and reasonable brokerage fees, legal costs and any design or construction fees directly related to and required pursuant to the terms of any such sublease) ("**Excess Rent**"), then Tenant shall be bound and obligated to pay Landlord as Additional Rent hereunder 50% of such Excess Rent within 10 days following receipt thereof by Tenant. If Tenant shall sublet the Premises or any part thereof, Tenant hereby immediately and irrevocably assigns to Landlord, as security for Tenant's obligations under this Lease, all rent from any such subletting, and Landlord as assignee and as attorney-in-fact for Tenant, or a receiver for Tenant appointed on Landlord's application, may collect such rent and apply it toward Tenant's obligations under this Lease; except that, until the occurrence of a Default, Tenant shall have the right to collect such rent.

(e) **No Waiver**. The consent by Landlord to an assignment or subletting shall not relieve Tenant or any assignees of this Lease or any sublessees of the Premises from obtaining the consent of Landlord to any further assignment or subletting nor shall it release Tenant or any assignee or sublessee of Tenant from full and primary liability under the Lease. The acceptance of Rent hereunder, or the acceptance of performance of any other term, covenant, or condition thereof, from any other person or entity shall not be deemed to be a waiver of any of the provisions of this Lease or a consent to any subletting, assignment or other transfer of the Premises.

(f) **Prior Conduct of Proposed Transferee**. Notwithstanding any other provision of this Section 22, if (i) the proposed assignee or sublessee of Tenant has been required by any prior landlord, lender or Governmental Authority to take remedial action in connection with Hazardous Materials contaminating a property, where the contamination resulted from such party's action or use of the property in question, (ii) the proposed assignee or sublessee is subject to an enforcement order issued by any Governmental Authority in connection with the use, storage, handling, treatment, generation, release or disposal of Hazardous Materials (including, without limitation, any order related to the failure to make a required reporting to any Governmental Authority), or (iii) because of the existence of a pre-existing environmental condition in the vicinity of or underlying the Project, the risk that Landlord would be targeted as a responsible party in connection with the remediation of such pre-existing environmental condition would be materially increased or exacerbated by the proposed use of Hazardous Materials by such proposed assignee or sublessee, Landlord shall have the absolute right to refuse to consent to any assignment or subletting to any such party.

23. **Estoppel Certificate**. Tenant shall, within 10 business days of written notice from Landlord, execute, acknowledge and deliver a statement in writing in any form reasonably requested by a

proposed lender or purchaser, (i) certifying that this Lease is unmodified and in full force and effect (or, if modified, stating the nature of such modification and certifying that this Lease as so modified is in full force and effect) and the dates to which the rental and other charges are paid in advance, if any, (ii) acknowledging that there are not any uncured defaults on the part of Landlord hereunder, or specifying such defaults if any are claimed, and (iii) setting forth such further information with respect to the status of this Lease or the Premises as may be requested thereon. Any such statement may be relied upon by any prospective purchaser or encumbrancer of all or any portion of the real property of which the Premises are a part. Tenant's failure to deliver such statement within such time shall, at the option of Landlord, constitute a Default under this Lease, and, in any event, shall be conclusive upon Tenant that the Lease is in full force and effect and without modification except as may be represented by Landlord in any certificate prepared by Landlord and delivered to Tenant for execution.

24. **Quiet Enjoyment**. So long as Tenant is not in Default under this Lease, Tenant shall, subject to the terms of this Lease, at all times during the Term, have peaceful and quiet enjoyment of the Premises against any person claiming by, through or under Landlord.

25. **Prorations**. All prorations required or permitted to be made hereunder shall be made on the basis of a 360 day year and 30 day months.

26. **Rules and Regulations**. Tenant shall, at all times during the Term and any extension thereof, comply with all reasonable rules and regulations at any time or from time to time established by Landlord covering use of the Premises and the Project. The current rules and regulations are attached hereto as **Exhibit E**. If there is any conflict between said rules and regulations and other provisions of this Lease, the terms and provisions of this Lease shall control. Landlord shall not have any liability or obligation for the breach of any rules or regulations by other tenants in the Project and shall not enforce such rules and regulations in a discriminatory manner.

27. **Subordination**. This Lease and Tenant's interest and rights hereunder are hereby made and shall be subject and subordinate at all times to the lien of any Mortgage now existing or hereafter created on or against the Project or the Premises, and all amendments, restatements, renewals, modifications, consolidations, refinancing, assignments and extensions thereof, without the necessity of any further instrument or act on the part of Tenant; provided, however that so long as there is no Default hereunder, Tenant's right to possession of the Premises shall not be disturbed by the Holder of any such Mortgage. Tenant agrees, at the election of the Holder of any such Mortgage, to attorn to any such Holder. Tenant agrees upon demand to execute, acknowledge and deliver such instruments, confirming such subordination, and such instruments of attornment as shall be requested by any such Holder, provided any such instruments contain appropriate non-disturbance provisions assuring Tenant's quiet enjoyment of the Premises as set forth in Section 24 hereof. Notwithstanding the foregoing, any such Holder may at any time subordinate its Mortgage to this Lease, without Tenant's consent, by notice in writing to Tenant, and thereupon this Lease shall be deemed prior to such Mortgage without regard to their respective dates of execution, delivery or recording and in that event such Holder shall have the same rights with respect to this Lease as though this Lease had been executed prior to the execution, delivery and recording of such Mortgage and had been assigned to such Holder, The term "**Mortgage**" whenever used in this Lease shall be deemed to include deeds of trust, security assignments and any other encumbrances, and any reference to the "Holder" of a Mortgage shall be deemed to include the beneficiary under a deed of trust. As of the date of this Lease, there is no existing Mortgage encumbering the Project.

28. **Surrender**. Upon the expiration of the Term or earlier termination of Tenant's right of possession, Tenant shall surrender the Premises to Landlord in the same condition as received, subject to any Alterations or Installations permitted by Landlord to remain in the Premises, free of Hazardous Materials brought upon, kept, used, stored, handled, treated, generated in, or released or disposed of from, the Premises by any person other than a Landlord Party (collectively, "**Tenant HazMat Operations**") and released of all Hazardous Materials Clearances, broom clean, ordinary wear and tear and casualty loss and condemnation covered by Sections 18 and 19 excepted. At least 3 months prior to

the surrender of the Premises, Tenant shall deliver to Landlord a narrative description of the actions proposed (or required by any Governmental Authority) to be taken by Tenant in order to surrender the Premises (including any Installations permitted by Landlord to remain in the Premises) at the expiration or earlier termination of the Term, free from any residual impact from the Tenant HazMat Operations and otherwise released for unrestricted use and occupancy (the "**Surrender Plan**"). Such Surrender Plan shall be accompanied by a current listing of (i) all Hazardous Materials licenses and permits held by or on behalf of any Tenant Party with respect to the Premises, and (ii) all Hazardous Materials used, stored, handled, treated, generated, released or disposed of from the Premises, and shall be subject to the review and approval of Landlord's environmental consultant. In connection with the review and approval of the Surrender Plan, upon the request of Landlord, Tenant shall deliver to Landlord or its consultant such additional non-proprietary information concerning Tenant HazMat Operations as Landlord shall request. On or before such surrender, Tenant shall deliver to Landlord evidence that the approved Surrender Plan shall have been satisfactorily completed and Landlord shall have the right, subject to reimbursement at Tenant's expense as set forth below, to cause Landlord's environmental consultant to inspect the Premises and perform such additional procedures as may be deemed reasonably necessary to confirm that the Premises are, as of the effective date of such surrender or early termination of the Lease, free from any residual impact from Tenant HazMat Operations. Tenant shall reimburse Landlord, as Additional Rent, for the actual out-of pocket expense incurred by Landlord for Landlord's environmental consultant to review and approve the Surrender Plan and to visit the Premises and verify satisfactory completion of the same, which cost shall not exceed $5,000. Landlord shall have the unrestricted right to deliver such Surrender Plan and any report by Landlord's environmental consultant with respect to the surrender of the Premises to third parties.

If Tenant shall fail to prepare or submit a Surrender Plan approved by Landlord, or if Tenant shall fail to complete the approved Surrender Plan, or if such Surrender Plan, whether or not approved by Landlord, shall fail to adequately address any residual effect of Tenant HazMat Operations in, on or about the Premises, Landlord shall have the right to take such actions as Landlord may deem reasonable or appropriate to assure that the Premises and the Project are surrendered free from any residual impact from Tenant HazMat Operations, the cost of which actions shall be reimbursed by Tenant as Additional Rent, without regard to the limitation set forth in the first paragraph of this Section 28.

Tenant shall immediately return to Landlord all keys and/or access cards to parking, the Project, restrooms or all or any portion of the Premises furnished to or otherwise procured by Tenant. If any such access card or key is lost, Tenant shall pay to Landlord, at Landlord's election, either the cost of replacing such lost access card or key or the cost of reprogramming the access security system in which such access card was used or changing the lock or locks opened by such lost key. Any Tenant's Property, Alterations and property not so removed by Tenant as permitted or required herein shall be deemed abandoned and may be stored, removed, and disposed of by Landlord at Tenant's expense, and Tenant waives all claims against Landlord for any damages resulting from Landlord's retention and/or disposition of such property. All obligations of Tenant hereunder not fully performed as of the termination of the Term, including the obligations of Tenant under Section 30 hereof, shall survive the expiration or earlier termination of the Term, including, without limitation, indemnity obligations, payment obligations with respect to Rent and obligations concerning the condition and repair of the Premises.

29. **Waiver of Jury Trial**. TO THE EXTENT PERMITTED BY LAW, TENANT AND LANDLORD WAIVE ANY RIGHT TO TRIAL BY JURY OR TO HAVE A JURY PARTICIPATE IN RESOLVING ANY DISPUTE, WHETHER SOUNDING IN CONTRACT, TORT, OR OTHERWISE, BETWEEN LANDLORD AND TENANT ARISING OUT OF THIS LEASE OR ANY OTHER INSTRUMENT, DOCUMENT, OR AGREEMENT EXECUTED OR DELIVERED IN CONNECTION HEREWITH OR THE TRANSACTIONS RELATED HERETO.

30. **Environmental Requirements**.

(a) **Prohibition/Compliance/Indemnity**. Tenant shall not cause or permit any Hazardous Materials (as hereinafter defined) to be brought upon, kept, used, stored, handled, treated, generated in

or about, or released or disposed of from, the Premises or the Project in violation of applicable Environmental Requirements (as hereinafter defined) by Tenant or any Tenant Party. If Tenant breaches the obligation stated in the preceding sentence, or if the presence of Hazardous Materials in the Premises during the Term or any holding over results in contamination of the Premises, the Project or any adjacent property or if contamination of the Premises, the Project or any adjacent property by Hazardous Materials brought into, kept, used, stored, handled, treated, generated in or about, or released or disposed of from, the Premises by anyone other than Landlord and Landlord's employees, agents and contractors otherwise occurs during the Term or any holding over, Tenant hereby indemnifies and shall defend and hold Landlord, its officers, directors, employees, agents and contractors harmless from any and all actions (including, without limitation, remedial or enforcement actions of any kind, administrative or judicial proceedings, and orders or judgments arising out of or resulting therefrom), costs, claims, damages (including, without limitation, punitive damages and damages based upon diminution in value of the Premises or the Project, or the loss of, or restriction on, use of the Premises or any portion of the Project), expenses (including, without limitation, attorneys', consultants' and experts' fees, court costs and amounts paid in settlement of any claims or actions), fines, forfeitures or other civil, administrative or criminal penalties, injunctive or other relief (whether or not based upon personal injury, property damage, or contamination of, or adverse effects upon, the environment, water tables or natural resources), liabilities or losses (collectively, "**Environmental Claims**") which arise during or after the Term as a result of such contamination. This indemnification of Landlord by Tenant includes, without limitation, costs incurred in connection with any investigation of site conditions or any cleanup, treatment, remedial, removal, or restoration work required by any federal, state or local Governmental Authority because of Hazardous Materials present in the air, soil or ground water above, on, or under the Premises. Without limiting the foregoing, if the presence of any Hazardous Materials on the Premises, the Project or any adjacent property caused or permitted by Tenant or any Tenant Party results in any contamination of the Premises, the Project or any adjacent property, Tenant shall promptly take all actions at its sole expense and in accordance with applicable Environmental Requirements as are necessary to return the Premises, the Project or any adjacent property to the condition existing prior to the time of such contamination, provided that Landlord's approval of such action shall first be obtained, which approval shall not unreasonably be withheld so long as such actions would not potentially have any material adverse long-term or short-term effect on the Premises or the Project. Notwithstanding anything to the contrary contained in this Section 30, Tenant shall not be responsible for, and the indemnification and hold harmless obligation set forth in this paragraph shall not apply to (i) contamination in the Premises which Tenant can prove to Landlord's reasonable satisfaction existed in the Premises immediately prior to the Commencement Date, or (ii) the presence of any Hazardous Materials in the Premises which Tenant can prove to Landlord's reasonable satisfaction migrated from outside of the Premises into the Premises, unless in either case, the presence of such Hazardous Materials (x) is the result of a breach by Tenant of any of its obligations under this Lease, or (y) was caused, contributed to or exacerbated by Tenant or any Tenant Party.

(b) **Business**. Landlord acknowledges that it is not the intent of this Section 30 to prohibit Tenant from using the Premises for the Permitted Use. Tenant may operate its business according to prudent industry practices so long as the use or presence of Hazardous Materials is strictly and properly monitored according to all then applicable Environmental Requirements. As a material inducement to Landlord to allow Tenant to use Hazardous Materials in connection with its business, Tenant agrees to deliver to Landlord prior to the Commencement Date a list identifying each type of Hazardous Materials to be brought upon, kept, used, stored, handled, treated, generated on, or released or disposed of from, the Premises and setting forth any and all governmental approvals or permits required in connection with the presence, use, storage, handling, treatment, generation, release or disposal of such Hazardous Materials on or from the Premises ("**Hazardous Materials List**"). Tenant shall deliver to Landlord an updated Hazardous Materials List at least once a year and shall also deliver an updated list before any new Hazardous Material is brought onto, kept, used, stored, handled, treated, generated on, or released or disposed of from, the Premises. Tenant shall deliver to Landlord true and correct copies of the following documents (the "**Haz Mat Documents**") relating to the use, storage, handling, treatment, generation, release or disposal of Hazardous Materials prior to the Commencement Date, or if unavailable at that time, concurrent with the receipt from or submission to a Governmental Authority: permits; approvals; reports and correspondence; storage and management plans, notice of violations of any Legal

Requirements; plans relating to the installation of any storage tanks to be installed in or under the Project (provided, said installation of tanks shall only be permitted after Landlord has given Tenant its written consent to do so, which consent may be withheld in Landlord's sole and absolute discretion); all closure plans or any other documents required by any and all federal, state and local Governmental Authorities for any storage tanks installed in, on or under the Project for the closure of any such tanks; and a Surrender Plan (to the extent surrender in accordance with Section 28 cannot be accomplished in 3 months). Tenant is not required, however, to provide Landlord with any portion(s) of the Haz Mat Documents containing information of a proprietary nature which, in and of themselves, do not contain a reference to any Hazardous Materials or hazardous activities. It is not the intent of this Section to provide Landlord with information which could be detrimental to Tenant's business should such information become possessed by Tenant's competitors.

(c) **Tenant Representation and Warranty**. Tenant hereby represents and warrants to Landlord that (i) neither Tenant nor any of its legal predecessors has been required by any prior landlord, lender or Governmental Authority at any time to take remedial action in connection with Hazardous Materials contaminating a property which contamination was permitted by Tenant of such predecessor or resulted from Tenant's or such predecessor's action or use of the property in question, and (ii) Tenant is not subject to any enforcement order issued by any Governmental Authority in connection with the use, storage, handling, treatment, generation, release or disposal of Hazardous Materials (including, without limitation, any order related to the failure to make a required reporting to any Governmental Authority). If Landlord determines that this representation and warranty was not true as of the date of this lease, Landlord shall have the right to terminate this Lease in Landlord's sole and absolute discretion.

(d) **Testing**. Landlord shall have the right to conduct annual tests of the Premises to determine whether any contamination of the Premises or the Project has occurred as a result of Tenant's use. Tenant shall be required to pay the cost of such annual test of the Premises; provided, however, that if Tenant conducts its own tests of the Premises using third party contractors and test procedures acceptable to Landlord which tests are certified to Landlord, Landlord shall accept such tests in lieu of the annual tests to be paid for by Tenant. In addition, at any time, and from time to time, prior to the expiration or earlier termination of the Term, Landlord shall have the right to conduct appropriate tests of the Premises and the Project to determine if contamination has occurred as a result of Tenant's use of the Premises. In connection with such testing, upon the request of Landlord, Tenant shall deliver to Landlord or its consultant such non-proprietary information concerning the use of Hazardous Materials in or about the Premises by Tenant or any Tenant Party. If contamination has occurred for which Tenant is liable under this Section 30, Tenant shall pay all costs to conduct such tests. If no such contamination is found, Landlord shall pay the costs of such tests (which shall not constitute an Operating Expense). Landlord shall provide Tenant with a copy of all third party, non-confidential reports and tests of the Premises made by or on behalf of Landlord during the Term without representation or warranty and subject to a confidentiality agreement. Tenant shall, at its sole cost and expense, promptly and satisfactorily remediate any environmental conditions identified by such testing in accordance with all Environmental Requirements. Landlord's receipt of or satisfaction with any environmental assessment in no way waives any rights which Landlord may have against Tenant.

(e) **Control Areas**, Tenant shall be allowed to utilize up to its pro rata share of the Hazardous Materials inventory within any control area or zone (located within the Premises), as designated by the applicable building code, for chemical use or storage. As used in the preceding sentence, Tenant's pro rata share of any control areas or zones located within the Premises shall be determined based on the rentable square footage that Tenant leases within the applicable control area or zone. For purposes of example only, if a control area or zone contains 10,000 rentable square feet and 2,000 rentable square feet of a tenant's premises are located within such control area or zone (while such premises as a whole contains 5,000 rentable square feet), the applicable tenant's pro rata share of such control area would be 20%.

(f) **Underground Tanks**. If underground or other storage tanks storing Hazardous Materials located on the Premises or the Project are used by Tenant or are hereafter placed on the Premises or the Project by Tenant, Tenant shall install, use, monitor, operate, maintain, upgrade and manage such

storage tanks, maintain appropriate records, obtain and maintain appropriate insurance, implement reporting procedures, properly close any underground storage tanks, and take or cause to be taken all other actions necessary or required under applicable state and federal Legal Requirements, as such now exists or may hereafter be adopted or amended in connection with the installation, use, maintenance, management, operation, upgrading and closure of such storage tanks.

(g) **Tenant's Obligations**. Tenant's obligations under this Section 30 shall survive the expiration or earlier termination of the Lease. During any period of time after the expiration or earlier termination of this Lease required by Tenant or Landlord to complete the removal from the Premises of any Hazardous Materials (including, without limitation, the release and termination of any licenses or permits restricting the use of the Premises and the completion of the approved Surrender Plan), Tenant shall continue to pay the full Rent in accordance with this Lease for any portion of the Premises not relet by Landlord in Landlord's sole discretion, which Rent shall be prorated daily.

(h) **Definitions**. As used herein, the term "**Environmental Requirements**" means all applicable present and future statutes, regulations, ordinances, rules, codes, judgments, orders or other similar enactments of any Governmental Authority regulating or relating to health, safety, or environmental conditions on, under, or about the Premises or the Project, or the environment, including without limitation, the following: the Comprehensive Environmental Response, Compensation and Liability Act; the Resource Conservation and Recovery Act; and all state and local counterparts thereto, and any regulations or policies promulgated or issued thereunder. As used herein, the term "**Hazardous Materials**" means and includes any substance, material, waste, pollutant, or contaminant listed or defined as hazardous or toxic, or regulated by reason of its impact or potential impact on humans, animals and/or the environment under any Environmental Requirements, asbestos and petroleum, including crude oil or any fraction thereof, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas). As defined in Environmental Requirements, Tenant is and shall be deemed to be the "**operator**" of Tenant's "**facility**" and the "**owner**" of all Hazardous Materials brought on the Premises by Tenant or any Tenant Party, and the wastes, by-products, or residues generated, resulting, or produced therefrom.

31. **Tenant's Remedies/Limitation of Liability**. Landlord shall not be in default hereunder unless Landlord fails to perform any of its obligations hereunder within 30 days after written notice from Tenant specifying such failure (unless such performance will, due to the nature of the obligation, require a period of time in excess of 30 days, then after such period of time as is reasonably necessary). Upon any default by Landlord, Tenant shall give notice by registered or certified mail to any Holder of a Mortgage covering the Premises and to any landlord of any lease of property in or on which the Premises are located and Tenant shall offer such Holder and/or landlord a reasonable opportunity to cure the default, including time to obtain possession of the Project by power of sale or a judicial action if such should prove necessary to effect a cure; provided Landlord shall have furnished to Tenant in writing the names and addresses of all such persons who are to receive such notices. All obligations of Landlord hereunder shall be construed as covenants, not conditions; and, except as may be otherwise expressly provided in this Lease, Tenant may not terminate this Lease for breach of Landlord's obligations hereunder.

All obligations of Landlord under this Lease will be binding upon Landlord only during the period of its ownership of the Premises and not thereafter. The term "**Landlord**" in this Lease shall mean only the owner for the time being of the Premises. Upon the transfer by such owner of its interest in the Premises, such owner shall thereupon be released and discharged from all obligations of Landlord thereafter accruing, but such obligations shall be binding during the Term upon each new owner for the duration of such owner's ownership.

32. **Inspection and Access**. Landlord and its agents, representatives, and contractors may enter the Premises at any reasonable time to inspect the Premises and to make such repairs as may be required or permitted pursuant to this Lease and for any other business purpose. Landlord and Landlord's representatives may enter the Premises during business hours on not less than 48 hours advance written notice (except in the case of emergencies in which case no such notice shall be required

and such entry may be at any time) for the purpose of effecting any such repairs, inspecting the Premises, showing the Premises to prospective purchasers and, during the last year of the Term, to prospective tenants or for any other business purpose. Landlord may erect a suitable sign on the Premises stating the Premises are available to let or that the Project is available for sale. Landlord may grant easements, make public dedications, designate Common Areas and create restrictions on or about the Project, provided that no such easement, dedication, designation or restriction materially, adversely affects Tenant's use or occupancy of the Premises for the Permitted Use. At Landlord's request, Tenant shall execute such instruments as may be necessary for such easements, dedications or restrictions. Tenant shall at all times, except in the case of emergencies, have the right to escort Landlord or its agents, representatives, contractors or guests while the same are in the Premises, provided such escort does not materially and adversely affect Landlord's access rights hereunder.

33. **Security**. Tenant acknowledges and agrees that security devices and services, if any, while intended to deter crime may not in given instances prevent theft or other criminal acts and that Landlord is not providing any security services with respect to the Premises. Tenant agrees that Landlord shall not be liable to Tenant for, and Tenant waives any claim against Landlord with respect to, any loss by theft or any other damage suffered or incurred by Tenant in connection with any unauthorized entry into the Premises or any other breach of security with respect to the Premises. Tenant shall be solely responsible for the personal safety of Tenant's officers, employees, agents, contractors, guests and invitees while any such person is in, on or about the Premises and/or the Project. Tenant shall at Tenant's cost obtain insurance coverage to the extent Tenant desires protection against such criminal acts.

34. **Force Majeure**. Landlord shall not be responsible or liable for delays in the performance of its obligations hereunder when caused by, related to, or arising out of acts of God, sinkholes or subsidence, strikes, lockouts, or other labor disputes, embargoes, quarantines, weather, national, regional, or local disasters, calamities, or catastrophes, inability to obtain labor or materials (or reasonable substitutes therefor) at reasonable costs or failure of, or inability to obtain, utilities necessary for performance, governmental restrictions, orders, limitations, regulations, or controls, national emergencies, delay in issuance or revocation of permits, enemy or hostile governmental action, terrorism, insurrection, riots, civil disturbance or commotion, fire or other casualty, and other causes or events beyond the reasonable control of Landlord ("**Force Majeure**").

35. **Brokers**. Landlord and Tenant each represents and warrants that it has not dealt with any broker, agent or other person (collectively, "**Broker**") in connection with this transaction and that no Broker brought about this transaction, other than CBRE. Landlord and Tenant each hereby agree to indemnify and hold the other harmless from and against any claims by any Broker, other than the broker, if any named in this Section 35, claiming a commission or other form of compensation by virtue of having dealt with Tenant or Landlord, as applicable, with regard to this leasing transaction.

36. **Limitation on Landlord's Liability**. NOTWITHSTANDING ANYTHING SET FORTH HEREIN OR IN ANY OTHER AGREEMENT BETWEEN LANDLORD AND TENANT TO THE CONTRARY: (A) LANDLORD SHALL NOT BE LIABLE TO TENANT OR ANY OTHER PERSON FOR (AND TENANT AND EACH SUCH OTHER PERSON ASSUME ALL RISK OF) LOSS, DAMAGE OR INJURY, WHETHER ACTUAL OR CONSEQUENTIAL TO: TENANT'S PERSONAL PROPERTY OF EVERY KIND AND DESCRIPTION, INCLUDING, WITHOUT LIMITATION TRADE FIXTURES, EQUIPMENT, INVENTORY, SCIENTIFIC RESEARCH, SCIENTIFIC EXPERIMENTS, LABORATORY ANIMALS, PRODUCT, SPECIMENS, SAMPLES, AND/OR SCIENTIFIC, BUSINESS, ACCOUNTING AND OTHER RECORDS OF EVERY KIND AND DESCRIPTION KEPT AT THE PREMISES AND ANY AND ALL INCOME DERIVED OR DERIVABLE THEREFROM; (B) THERE SHALL BE NO PERSONAL RECOURSE TO LANDLORD FOR ANY ACT OR OCCURRENCE IN, ON OR ABOUT THE PREMISES OR ARISING IN ANY WAY UNDER THIS LEASE OR ANY OTHER AGREEMENT BETWEEN LANDLORD AND TENANT WITH RESPECT TO THE SUBJECT MATTER HEREOF AND ANY LIABILITY OF LANDLORD HEREUNDER SHALL BE STRICTLY LIMITED SOLELY TO LANDLORD'S INTEREST IN THE PROJECT OR ANY PROCEEDS FROM SALE OR CONDEMNATION THEREOF AND ANY INSURANCE PROCEEDS PAYABLE IN RESPECT OF LANDLORD'S INTEREST IN THE

PROJECT OR IN CONNECTION WITH ANY SUCH LOSS; AND (C) IN NO EVENT SHALL ANY PERSONAL LIABILITY BE ASSERTED AGAINST LANDLORD IN CONNECTION WITH THIS LEASE NOR SHALL ANY RECOURSE BE HAD TO ANY OTHER PROPERTY OR ASSETS OF LANDLORD OR ANY OF LANDLORD'S OFFICERS, DIRECTORS, EMPLOYEES, AGENTS OR CONTRACTORS. UNDER NO CIRCUMSTANCES SHALL LANDLORD OR ANY OF LANDLORD'S OFFICERS, DIRECTORS, EMPLOYEES, AGENTS OR CONTRACTORS BE LIABLE FOR INJURY TO TENANT'S BUSINESS OR FOR ANY LOSS OF INCOME OR PROFIT THEREFROM.

37. **Severability**. If any clause or provision of this Lease is illegal, invalid or unenforceable under present or future laws, then and in that event, it is the intention of the parties hereto that the remainder of this Lease shall not be affected thereby. It is also the intention of the parties to this Lease that in lieu of each clause or provision of this Lease that is illegal, invalid or unenforceable, there be added, as a part of this Lease, a clause or provision as similar in effect to such illegal, invalid or unenforceable clause or provision as shall be legal, valid and enforceable.

38. **Signs; Exterior Appearance**. Tenant shall not, without the prior written consent of Landlord, which may be granted or withheld in Landlord's sole discretion: (i) attach any awnings, exterior lights, decorations, balloons, flags, pennants, banners, painting or other projection to any outside wall of the Project, (ii) use any curtains, blinds, shades or screens other than Landlord's standard window coverings, (iii) coat or otherwise sunscreen the interior or exterior of any windows, (iv) place any bottles, parcels, or other articles on the window sills, (v) place any equipment, furniture or other items of personal property on any exterior balcony, or (vi) paint, affix or exhibit on any part of the Premises or the Project any signs, notices, window or door lettering, placards, decorations, or advertising media of any type which can be viewed from the exterior of the Premises. Interior signs on doors and the directory tablet shall be inscribed, painted or affixed for Tenant by Landlord at the sole cost and expense of Tenant, and shall be of a size, color and type acceptable to Landlord. Notwithstanding the foregoing, Tenant shall have the right, at Tenant's sole cost and expense, the paint or affix signage bearing Tenant's name and logo on its interior entrance door and window, provided that such signage shall be subject to Landlord's reasonable approval and applicable Legal Requirements. Nothing may be placed on the exterior of corridor walls or corridor doors other than Landlord's standard lettering. The directory tablet shall be provided exclusively for the display of the name and location of tenants.

Landlord intends to erect a monument sign at the Project, in a location acceptable to Landlord in its sole and absolute discretion, upon which the names of tenants of the Project shall be displayed ("**Monument Sign**"), Tenant shall have the non-exclusive right, at Tenant's sole cost and expense, to display Tenant's name on such Monument Sign. Tenant acknowledges and agrees that Tenant's signage on the Monument Sign including, without limitation, the size, color and type, shall be subject to Landlord's prior written approval, which shall not be unreasonably withheld and shall be consistent with Landlord's signage program at the Project and applicable Legal Requirements. Tenant shall be responsible, at Tenant's sole cost and expense, for the maintenance of Tenant's signage on the Monument Sign, for the removal of Tenant's signage on the Monument Sign at the expiration or earlier termination of this Lease and for the repair all damage resulting from such removal.

39. **Right to Expand**.

(a) Commencing on the first day of the 25th month of the Base Term and no later than the expiration of the 36th month of the Base Term (the "**Expansion Period**"), Tenant shall have the right, but not the obligation, to expand the Premises (the "**Expansion Right**") to include the Expansion Space in the Building upon the terms and conditions contained in this Section. For purposes of this Section 39(a), "**Expansion Space**" shall mean that certain approximately 3,000 rentable square feet of space, as shown on **Exhibit H**, if the same is not occupied by a tenant or which is occupied by an existing tenant whose lease is expiring within 6 months or less and such tenant does not wish to renew (whether or not such tenant has a right to renew) its occupancy of such space. If Tenant elects to exercise its Expansion Right pursuant to this Section 39(a), Tenant shall deliver no less than 9 months and no more than 12 months advance written notice to Landlord of such election ("**Expansion Notice**"), which Expansion Notice shall

be delivered no earlier than the last day of the 12th month of the Base Term and no later than the last day of the 24th month of the Base Term ("**Election Period**"). If Tenant elects to lease the Expansion Space by delivering the Expansion Notice within the Election Period, Tenant shall be deemed to agree to lease the Expansion Space on the same terms and conditions as this Lease except that (i) the commencement date of the Lease with respect to the Expansion Space shall be date that Landlord delivers the Expansion Premises to Tenant for Tenant's construction of tenant improvements within the Expansion Space ("**Expansion Space Commencement Date**"); (ii) Tenant shall continue to pay Base Rent for the original Premises as provided for in this Lease and, in addition thereto, commencing on the Expansion Space Commencement Date, Tenant shall pay Base Rent for the Expansion Space at the same per square foot Base Rent as the original Premises (as adjusted pursuant to Section 4); (iii) Tenant's Share of Operating Expenses shall be proportionately adjusted; (iv) the Security Deposit shall be increased by an amount equal to 3 months Base Rent for the Expansion Space (which amount shall be subject to reduction pursuant to the last paragraph of Section 6); and (v) Landlord shall provide a tenant improvement allowance ("**Expansion Space TI Allowance**") for the construction of tenant improvements within the Expansion Space of a fixed and permanent nature desired by Tenant and approved by Landlord, which tenant improvements shall be treated as Alterations pursuant to Section 12, in an amount up to $2.00 per rentable square foot of the Expansion Space for each month remaining in the Base Term of the Lease (for example, if the Expansion Space Commencement Date occurs with 34 months remaining in the Base Term, Landlord shall provide to Tenant a tenant improvement allowance equal to $68.00 per rentable square foot of the Expansion Space ($2.00 multiplied by the 34 months remaining in the Base Term). Notwithstanding anything to the contrary contained herein, in no event shall the Work Letter apply to the Expansion Space. Tenant's failure to deliver an Expansion Notice to Landlord during the Election Period shall be deemed to be an election by Tenant not to exercise Tenant's right to lease the Expansion Space in which case Tenant shall be deemed to have forever waived its right to lease the Expansion Space and Landlord shall thereafter have the right to lease the Expansion Space to any third party on any terms and conditions acceptable to Landlord.

(b) **Amended Lease**. If: (i) Tenant fails to timely deliver an Expansion Notice within the Election Period, or (ii) after the expiration of a period of 30 days from the date Tenant delivers the Election Notice, no lease amendment or lease agreement for the Expansion Space has been mutually executed, Tenant shall be deemed to have waived its right to lease the Expansion Space.

(c) **Exceptions**. Notwithstanding the above, the Expansion Right shall, at Landlord's option not be in effect and may not be exercised by Tenant:

(i) during any period of time that Tenant is in Default under any provision of the Lease; or

(ii) if Tenant has been in Default under any provision of the Lease 3 or more times, whether or not the Defaults are cured, during the 12 month period prior to the date on which Tenant seeks to exercise the Expansion Right.

(d) **Termination**. The Expansion Right shall, at Landlord's option, terminate and be of no further force or effect even after Tenant's due and timely exercise of the Expansion Right, if, after such exercise, but prior to the commencement date of the lease of such Expansion Space, (i) Tenant fails to timely cure any default by Tenant under the Lease; or (ii) Tenant has Defaulted 3 or more times during the period from the date of the exercise of the Expansion Right to the date of the commencement of the lease of the Expansion Space, whether or not such Defaults are cured.

(e) **Rights Personal**. Expansion Rights are personal to Tenant and are not assignable without Landlord's consent, which may be granted or withheld in Landlord's sole discretion separate and apart from any consent by Landlord to an assignment of Tenant's interest in the Lease, except that they may be assigned in connection with any Permitted Assignment of this Lease.

(f) **No Extensions**. The period of time within which any Expansion Rights may be exercised shall not be extended or enlarged by reason of Tenant's inability to exercise the Expansion Rights.

40. **Right to Extend Term**. Tenant shall have the right to extend the Term of the Lease upon the following terms and conditions:

(a) **Extension Rights**. Tenant shall have 1 right (an "**Extension Right**") to extend the term of this Lease for 5 years (an "**Extension Term**") on the same terms and conditions as this Lease (other than with respect to Base Rent) by giving Landlord written notice of its election to exercise the Extension Right at least 9 months prior to the expiration of the Base Term of the Lease.

Upon the commencement of the Extension Term, Base Rent shall be payable at the Market Rate (as defined below). Base Rent shall thereafter be adjusted on each annual anniversary of the commencement of such Extension Term by the Rent Adjustment Percentage. As used herein, "**Market Rate**" shall mean the then market rental rate as determined by Landlord and agreed to by Tenant, which shall in no event be less than the Base Rent payable as of the date immediately preceding the commencement of such Extension Term increased by the Rent Adjustment Percentage multiplied by such Base Rent.

If, on or before the date which is 180 days prior to the expiration of the Base Term of this Lease, Tenant has not agreed with Landlord's determination of the Market Rate during the Extension Term after negotiating in good faith, Tenant shall be deemed to have elected arbitration as described in Section 40(b). Tenant acknowledges and agrees that, if Tenant has elected to exercise the Extension Right by delivering notice to Landlord as required in this Section 40(a), Tenant shall have no right thereafter to rescind or elect not to extend the term of the Lease for the Extension Term.

(b) **Arbitration**.

(i) Within 10 days of Tenant's notice to Landlord of its election (or deemed election) to arbitrate Market Rate, each party shall deliver to the other a proposal containing the Market Rate that the submitting party believes to be correct ("**Extension Proposal**"). If either party fails to timely submit an Extension Proposal, the other party's submitted proposal shall determine the Base Rent for the first year of the Extension Term. If both parties submit Extension Proposals, then Landlord and Tenant shall meet within 7 days after delivery of the last Extension Proposal and make a good faith attempt to mutually appoint a single Arbitrator (and defined below) to determine the Market Rate. If Landlord and Tenant are unable to agree upon a single Arbitrator, then each shall, by written notice delivered to the other within 10 days after the meeting, select an Arbitrator. If either party fails to timely give notice of its selection for an Arbitrator, the other party's submitted proposal shall determine the Base Rent for the first year of the Extension Term. The 2 Arbitrators so appointed shall, within 5 business days after their appointment, appoint a third Arbitrator. If the 2 Arbitrators so selected cannot agree on the selection of the third Arbitrator within the time above specified, then either party, on behalf of both parties, may request such appointment of such third Arbitrator by application to any state court of general jurisdiction in the jurisdiction in which the Premises are located, upon 10 days prior written notice to the other party of such intent.

(ii) The decision of the Arbitrator(s) shall be made within 30 days after the appointment of a single Arbitrator or the third Arbitrator, as applicable. The decision of the single Arbitrator shall be final and binding upon the parties. The average of the two closest Arbitrators in a three Arbitrator panel shall be final and binding upon the parties. Each party shall pay the fees and expenses of the Arbitrator appointed by or on behalf of such party and the fees and expenses of the third Arbitrator shall be borne equally by both parties. If the Market Rate for the first year of the Extension Term is not determined by the first day of the Extension Term, then Tenant shall pay Landlord Base Rent in an amount equal to the Base Rent in effect immediately prior to the Extension Term and increased by the Rent Adjustment Percentage until such

determination is made. After the determination of the Market Rate, the parties shall make any necessary adjustments to such payments made by Tenant. Landlord and Tenant shall then execute an amendment recognizing the Market Rate for the Extension Term.

(iii) An "**Arbitrator**" shall be any person appointed by or on behalf of either party or appointed pursuant to the provisions hereof and: (i) shall be (A) a member of the American Institute of Real Estate Appraisers with not less than 10 years of experience in the appraisal of improved office and high tech industrial real estate in the greater Seattle metropolitan area, or (B) a licensed commercial real estate broker with not less than 15 years experience representing landlords and/or tenants in the leasing of high tech or life sciences space in the greater Seattle metropolitan area, (ii) devoting substantially all of their time to professional appraisal or brokerage work, as applicable, at the time of appointment and (iii) be in all respects impartial and disinterested.

(c) **Rights Personal**. The Extension Right is personal to Tenant and is not assignable without Landlord's consent, which may be granted or withheld in Landlord's sole discretion separate and apart from any consent by Landlord to an assignment of Tenant's interest in the Lease, except that they may be assigned in connection with any Permitted Assignment of this Lease.

(d) **Exceptions**. Notwithstanding anything set forth above to the contrary, Extension Rights shall, at Landlord's option, not be in effect and Tenant may not exercise the Extension Right:

(i) during any period of time that Tenant is in Default under any provision of this Lease; or

(ii) if Tenant has been in Default under any provision of this Lease 3 or more times, whether or not the Defaults are cured, during the 12 month period immediately prior to the date that Tenant intends to exercise the Extension Right, whether or not the Defaults are cured.

(e) **No Extensions**. The period of time within which the Extension Right may be exercised shall not be extended or enlarged by reason of Tenant's inability to exercise the Extension Right.

(f) **Termination**. The Extension Right, at Landlord's option, shall terminate and be of no further force or effect even after Tenant's due and timely exercise of the Extension Right, if, after such exercise, but prior to the commencement date of the Extension Term, (i) Tenant fails to timely cure any default by Tenant under this Lease; or (ii) Tenant has Defaulted 3 or more times during the period from the date of the exercise of the Extension Right to the date of the commencement of the Extension Term, whether or not such Defaults are cured.

41. **Right to Terminate**. Only if Tenant has timely and properly exercised its Expansion Notice in accordance with the terms of Section 39(a) and Landlord is required and does not deliver the Expansion Space to Tenant during the Expansion Period ("**Expansion Failure Delivery**"), Tenant shall have the right to terminate this Lease ("**Termination Right**") upon delivery of no less than 9 months advance written notice to Landlord ("**Termination Notice**"). Tenant's Termination Notice shall set forth the date upon which Tenant elects to terminate this Lease, which shall in no event be earlier than 9 months after Tenant's delivery to Landlord of the Termination Notice ("**Termination Date**"). If this Lease is terminated pursuant to this Section 41, then Tenant shall vacate the Premises and deliver possession thereof to Landlord in the condition required by the terms of this Lease on or before the Termination Date, and Tenant shall have no further obligations under this Lease except for those accruing prior to the Termination Date, including the obligation to pay Rent through the Termination Date and those which, pursuant to the terms of the Lease, survive the expiration or early termination of the Lease. Notwithstanding anything to the contrary contained herein, if Tenant fails to deliver a Termination Notice to Landlord within 30 days after an Expansion Failure Delivery, Tenant's Termination Right under this Section 41 shall immediately terminate and this Section 41 shall be of no further force and effect.

42. **Intentionally Omitted**.

43. **Asbestos**.

(a) **Notification of Asbestos**. Landlord hereby notifies Tenant of the presence of asbestos-containing materials ("**ACMs**") and/or presumed asbestos-containing materials ("**PACMs**") within or about the Premises in the Location identified in **Exhibit G**.

(b) **Tenant Acknowledgement**. Tenant hereby acknowledges receipt of the notification in paragraph (a) of this Section 43 and understands that the purpose of such notification is to make Tenant and any agents, employees, and contractors of Tenant, aware of the presence of ACMs and/or PACMs within or about the Building in order to avoid or minimize any damage to or disturbance of such ACMs and/or PACMs.

CMR
Tenant's Initials

(c) **Acknowledgement from Contractors/Employees**. Tenant shall give Landlord at least 14 days' prior written notice before conducting, authorizing or permitting any of the activities listed below within or about the Premises, and before soliciting bids from any person to perform such services. Such notice shall identify or describe the proposed scope, location, date and time of such activities and the name, address and telephone number of each person who may be conducting such activities. Thereafter, Tenant shall grant Landlord reasonable access to the Premises to determine whether any ACMs or PACMs will be disturbed in connection with such activities. Tenant shall not solicit bids from any person for the performance of such activities without Landlord's prior written approval. Upon Landlord's request, Tenant shall deliver to Landlord a copy of a signed acknowledgement from any contractor, agent, or employee of Tenant acknowledging receipt of information describing the presence of ACMs and/or PACMs within or about the Premises in the locations identified in **Exhibit G** prior to the commencement of such activities. Nothing in this Section 43 shall be deemed to expand Tenant's rights under the Lease or otherwise to conduct, authorize or permit any such activities.

(i) Removal of thermal system insulation ("**TSI**") and surfacing ACMs and PACMs (i.e., sprayed-on or troweled-on material, e.g., textured ceiling paint or fireproofing material);

(ii) Removal of ACMs or PACMs that are not TSI or surfacing ACMs or PACMs; or

(iii) Repair and maintenance of operations that are likely to disturb ACMs or PACMs.

44. **Miscellaneous**.

(a) **Notices**. All notices or other communications between the parties shall be in writing and shall be deemed duly given upon delivery or refusal to accept delivery by the addressee thereof if delivered in person, or upon actual receipt if delivered by reputable overnight guaranty courier, addressed and sent to the parties at their addresses set forth above. Landlord and Tenant may from time to time by written notice to the other designate another address for receipt of future notices.

(b) **Joint and Several Liability**. If and when included within the term "**Tenant**," as used in this instrument, there is more than one person entity, each shall be jointly and severally liable for the obligations of Tenant.

(c) **Financial Information**. Tenant shall furnish Landlord with true and complete copies of (i) Tenant's most recent audited annual financial statements within 90 days of the end of each of Tenant's fiscal years during the Term, (ii) Tenant's most recent unaudited quarterly financial statements within 45 days of the end of each of Tenant's first three fiscal quarters of each of Tenant's fiscal years during the Term, (iii) at Landlord's request from time to time, but not more than once per year, updated business

plans, including cash flow projections and/or pro forma balance sheets and income statements, all of which shall be treated by Landlord as confidential information belonging to Tenant, (iv) corporate brochures and/or profiles prepared by Tenant for prospective investors, and (v) any other financial information or summaries that Tenant typically provides to its lenders or shareholders.

(d) **Recordation**. Neither this Lease nor a memorandum of lease shall be filed by or on behalf of Tenant in any public record. Landlord may prepare and file, and upon request by Landlord Tenant will execute, a memorandum of lease.

(e) **Interpretation**. The normal rule of construction to the effect that any ambiguities are to be resolved against the drafting party shall not be employed in the interpretation of this Lease or any exhibits or amendments hereto. Words of any gender used in this Lease shall be held and construed to include any other gender, and words in the singular number shall be held to include the plural, unless the context otherwise requires. The captions inserted in this Lease are for convenience only and in no way define, limit or otherwise describe the scope or intent of this Lease, or any provision hereof, or in any way affect the interpretation of this Lease.

(f) **Not Binding Until Executed**. The submission by Landlord to Tenant of this Lease shall have no binding force or effect, shall not constitute an option for the leasing of the Premises, nor confer any right or impose any obligations upon either party until execution of this Lease by both parties.

(g) **Limitations on Interest**. it is expressly the intent of Landlord and Tenant at all times to comply with applicable law governing the maximum rate or amount of any interest payable on or in connection with this Lease. If applicable law is ever judicially interpreted so as to render usurious any interest called for under this Lease, or contracted for, charged, taken, reserved, or received with respect to this Lease, then it is Landlord's and Tenant's express intent that all excess amounts theretofore collected by Landlord be credited on the applicable obligation (or, if the obligation has been or would thereby be paid in full, refunded to Tenant), and the provisions of this Lease immediately shall be deemed reformed and the amounts thereafter collectible hereunder reduced, without the necessity of the execution of any new document, so as to comply with the applicable law, but so as to permit the recovery of the fullest amount otherwise called for hereunder.

(h) **Choice of Law**. Construction and interpretation of this Lease shall be governed by the internal laws of the state in which the Premises are located, excluding any principles of conflicts of laws.

(i) **Time**. Time is of the essence as to the performance of Tenant's obligations under this Lease.

(j) **OFAC**. Tenant, and all beneficial owners of Tenant, are currently (a) in compliance with and shall at all times during the Term of this Lease remain in compliance with the regulations of the Office of Foreign Assets Control ("**OFAC**") of the U.S. Department of Treasury and any statute, executive order, or regulation relating thereto (collectively, the "**OFAC Rules**"), (b) not listed on, and shall not during the term of this Lease be listed on, the Specially Designated Nationals and Blocked Persons List maintained by OFAC and/or on any other similar list maintained by OFAC or other governmental authority pursuant to any authorizing statute, executive order, or regulation, and (c) not a person or entity with whom a U.S. person is prohibited from conducting business under the OFAC Rules.

(k) **Incorporation by Reference**. All exhibits and addenda attached hereto are hereby incorporated into this Lease and made a part hereof. If there is any conflict between such exhibits or addenda and the terms of this Lease, such exhibits or addenda shall control.

(l) **Entire Agreement**. This Lease, including the exhibits attached hereto, constitutes the entire agreement between Landlord and Tenant pertaining to the subject matter hereof and supersedes all prior and contemporaneous agreements, understandings, letters of intent, negotiations and discussions, whether oral or written, of the parties, and there are no warranties, representations or other agreements, express or implied, made to either party by the other party in connection with the subject matter hereof except as specifically set forth herein.

(m) **No Accord and Satisfaction**. No payment by Tenant or receipt by Landlord of a lesser amount than the monthly installment of Base Rent or any Additional Rent will be other than on account of the earliest stipulated Base Rent and Additional Rent, nor will any endorsement or statement on any check or letter accompanying a check for payment of any Base Rent or Additional Rent be an accord and satisfaction. Landlord may accept such check or payment without prejudice to Landlord's right to recover the balance of such Rent or to pursue any other remedy provided in this Lease.

(n) **Hazardous Activities**. Notwithstanding any other provision of this Lease, Landlord, for itself and its employees, agents and contractors, reserves the right to refuse to perform any repairs or services in any portion of the Premises which, pursuant to Tenant's routine safety guidelines, practices or custom or prudent industry practices, require any form of protective clothing or equipment other than safety glasses. in any such case, Tenant shall contract with parties who are acceptable to Landlord, in Landlord's reasonable discretion, for all such repairs and services, and Landlord shall, to the extent required, equitably adjust Tenant's Share of Operating Expenses in respect of such repairs or services to reflect that Landlord is not providing such repairs or services to Tenant.

[Signatures on next page]

IN WITNESS WHEREOF, Landlord and Tenant have executed this Lease as of the day and year first above written.

TENANT:

ADAPTIVE TCR CORPORATION,
a Washington corporation
By: /s/ Chad Robins
Its: President & CEO

LANDLORD:

ARE-SEATTLE NO. 11, LLC,
a Delaware limited liability company

By: ALEXANDRIA REAL ESTATE EQUITIES, L.P., a Delaware limited partnership, managing member

By: ARE-QRS CORP.,
a Maryland corporation,
general partner

By: /s/ Jackie Clem
Its: VP Real Estate Legal Affairs

EXHIBIT A TO LEASE

DESCRIPTION OF PREMISES

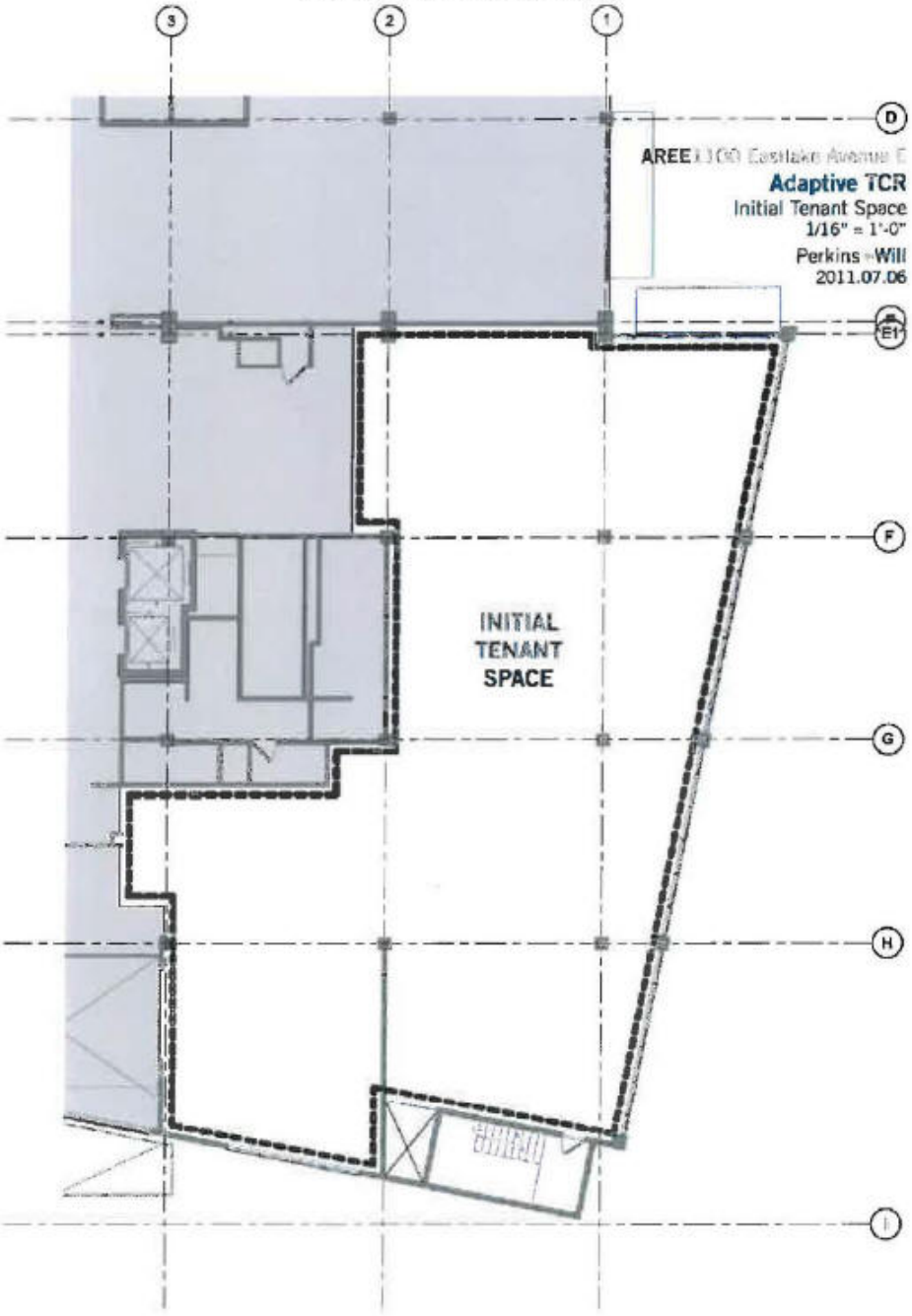


EXHIBIT B TO LEASE
DESCRIPTION OF PROJECT

PARCEL A:

LOTS 1, 2, 3, 4, 17, 18, 19 AND 20, BLOCK 4, DOYLE'S ADDITION TO THE CITY OF SEATTLE, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 3 OF PLATS, PAGE(S) 122, IN KING COUNTY, WASHINGTON;

ALSO LOTS 1, 2, 3 AND 4, BLOCK 64, LAKE UNION SHORELANDS, IN KING COUNTY, WASHINGTON, AS SHOWN ON THE OFFICIAL MAPS ON FILE IN THE OFFICE OF THE COMMISSIONER OF PUBLIC LANDS AT OLYMPIA, WASHINGTON;

TOGETHER WITH THAT PORTION OF THE VACATED SOUTH 20 FEET OF EAST GARFIELD STREET AS VACATED UNDER ORDINANCE NUMBER 88193 OF THE CITY OF SEATTLE ADJOINING AND LYING EASTERLY OF THE EASTERLY MARGIN OF FAIRVIEW AVENUE NORTH AS ESTABLISHED BY DECREE ENTERED IN KING COUNTY SUPERIOR COURT CAUSE NUMBER 204496 AND WESTERLY OF THE WESTERLY LINE OF SAID DOYLE'S ADDITION.

PARCEL B:

ALL OF LOTS 5 AND 16, AND THE NORTH 23.5 FEET OF LOTS 6 AND 15, ALL IN BLOCK 4, DOYLE'S ADDITION TO THE CITY OF SEATTLE, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 3 OF PLATS, PAGE(S) 122, IN KING COUNTY, WASHINGTON;

ALSO, LOT 5 AND THE NORTH 23.5 FEET OF LOT 6, BLOCK 64, LAKE UNION SHORELANDS, IN KING COUNTY, WASHINGTON, AS SHOWN ON THE OFFICIAL MAPS ON FILE IN THE OFFICE OF THE COMMISSIONER OF PUBLIC LANDS AT OLYMPIA, WASHINGTON.

EXHIBIT C TO LEASE

WORK LETTER

THIS WORK LETTER dated July 21, 2011 (this "**Work Letter**") is made and entered into by and between **ARE-SEATTLE NO. 11, LLC**, a Delaware limited liability company ("**Landlord**"), and **ADAPTIVE TCR CORPORATION**, a Washington corporation ("**Tenant**"), and is attached to and made a part of the Lease Agreement dated July 21, 2011 (the "**Lease**"), by and between Landlord and Tenant. Any initially capitalized terms used but not defined herein shall have the meanings given them in the Lease.

1. **General Requirements**.

(a) Tenant's Authorized Representative. Tenant designates Chad Robins ("**Tenant's Representative**") as the only person authorized to act for Tenant pursuant to this Work Letter. Landlord shall not be obligated to respond to or act upon any request, approval, inquiry or other communication ("**Communication**") from or on behalf of Tenant in connection with this Work Letter unless such Communication is in writing from Tenant's Representative. Tenant may change Tenant's Representative at any time upon not less than 5 business days advance written notice to Landlord. Neither Tenant nor Tenant's Representative shall be authorized to direct Landlord's contractors in the performance of Landlord's Work (as hereinafter defined).

(b) Landlord's Authorized Representative. Landlord designates John Cox and Tim McBride (either such individual acting alone, "**Landlord's Representative**") as the only persons authorized to act for Landlord pursuant to this Work Letter. Tenant shall not be obligated to respond to or act upon any request, approval, inquiry or other Communication from or on behalf of Landlord in connection with this Work Letter unless such Communication is in writing from Landlord's Representative. Landlord may change either Landlord's Representative at any time upon not less than 5 business days advance written notice to Tenant. Landlord's Representative shall be the sole persons authorized to direct Landlord's contractors in the performance of Landlord's Work.

(c) Architects, Consultants and Contractors. Landlord and Tenant hereby acknowledge and agree that: (i) the general contractor and any subcontractors for the Tenant Improvements shall be selected by Landlord, subject to Tenant's approval, which approval shall not be unreasonably withheld, conditioned or delayed, and (ii) Perkins + Will shall be the architect (the "**TI Architect**") for the Tenant Improvements.

2. **Tenant Improvements**.

(a) Tenant Improvements Defined. As used herein, "**Tenant Improvements**" shall mean all improvements to the Project of a fixed and permanent nature as shown on the TI Construction Drawings, as defined in Section 2(c) below. Other than Landlord's Work (as defined in Section 3(a) below, Landlord shall not have any obligation whatsoever with respect to the finishing of the Premises for Tenant's use and occupancy.

(b) Tenant's Space Plans. Landlord and Tenant acknowledge and agree that the plan prepared by the TI Architect attached hereto as **Exhibit I** (the "**Space Plan**") has been approved by both Landlord and Tenant. Landlord and Tenant further acknowledge and agree that any changes to the Space Plan constitute a Change Request the cost of which changes shall be paid for by Tenant. Tenant shall be solely responsible for all costs incurred by Landlord to alter the Building (or Landlord's plans for the Building) as a result of Tenant's requested changes.

(c) Working Drawings. Landlord shall cause the TI Architect to prepare and deliver to Tenant for review and comment construction plans, specifications and drawings for the Tenant Improvements ("**TI Construction Drawings**"), which TI Construction Drawings shall be prepared

substantially in accordance with the Space Plan. Tenant shall be solely responsible for ensuring that the TI Construction Drawings reflect Tenant's requirements for the Tenant Improvements. Tenant shall deliver its written comments on the TI Construction Drawings to Landlord not later than 10 business days after Tenant's receipt of the same; provided, however, that Tenant may not disapprove any matter that is consistent with the Space Plan without submitting a Change Request. Landlord and the TI Architect shall consider all such comments in good faith and shall, within 10 business days after receipt, notify Tenant how Landlord proposes to respond to such comments, but Tenant's review rights pursuant to the foregoing sentence shall not delay the design or construction schedule for the Tenant Improvements. Any disputes in connection with such comments shall be resolved in accordance with Section 2(d) hereof. Provided that the design reflected in the TI Construction Drawings is consistent with the Space Plan, Tenant shall approve the TI Construction Drawings submitted by Landlord, unless Tenant submits a Change Request. Once approved by Tenant, subject to the provisions of Section 4 below, Landlord shall not materially modify the TI Construction Drawings except as may be reasonably required in connection with the issuance of the TI Permit (as defined in Section 3(b) below).

(d) Approval and Completion. It is hereby acknowledged by Landlord and Tenant that the TI Construction Drawings must be completed and approved not later than August 1, 2011, in order for Landlord's Work to be Substantially Complete by the Target Commencement Date (as defined in the Lease). Upon any dispute regarding the design of the Tenant Improvements, which is not settled within 10 business days after notice of such dispute is delivered by one party to the other, Tenant may make the final decision regarding the design of the Tenant Improvements, provided (i) Tenant acts reasonably and such final decision is either consistent with or a compromise between Landlord's and Tenant's positions with respect to such dispute, (ii) that all costs and expenses resulting from any such decision by Tenant shall be payable by Tenant, and (iii) Tenant's decision will not affect the base Building, structural components of the Building or any Building systems. Any changes to the TI Construction Drawings following Landlord's and Tenant's approval of same requested by Tenant shall be processed as provided in Section 4 hereof.

3. **Performance of Landlord's Work**.

(a) Definition of Landlord's Work. As used herein, "**Landlord's Work**" shall mean the work of constructing the Tenant Improvements.

(b) Commencement and Permitting. Landlord shall commence construction of the Tenant Improvements upon obtaining a building permit (the **"TI Permit")** authorizing the construction of the Tenant Improvements consistent with the TI Construction Drawings approved by Tenant. The cost of obtaining the TI Permit shall be payable by Landlord. Tenant shall assist Landlord in obtaining the TI Permit. If any Governmental Authority having jurisdiction over the construction of Landlord's Work or any portion thereof shall impose terms or conditions upon the construction thereof that: (i) are inconsistent with Landlord's obligations hereunder, (ii) increase the cost of constructing Landlord's Work, or (iii) will materially delay the construction of Landlord's Work, Landlord and Tenant shall reasonably and in good faith seek means by which to mitigate or eliminate any such adverse terms and conditions.

(c) Completion of Landlord's Work. Landlord shall substantially complete or cause to be substantially completed Landlord's Work in a good and workmanlike manner, in accordance with the TI Permit subject, in each case, to Minor Variations and normal "punch list" items of a non-material nature that do not interfere with the use of the Premises ("**Substantial Completion**" or "**Substantially Complete**"). Upon Substantial Completion of Landlord's Work, Landlord shall require the TI Architect and the general contractor to execute and deliver, for the benefit of Tenant and Landlord, a Certificate of Substantial Completion in the form of the American Institute of Architects ("**AlA**") document G704. For purposes of this Work Letter, "**Minor Variations**" shall mean any modifications reasonably required: (i) to comply with all applicable Legal Requirements and/or to obtain or to comply with any required permit (including the TI Permit); (ii) to comply with any request by Tenant for modifications to Landlord's Work; (iii) to comport with good design, engineering, and construction practices that are not material; or (iv) to make reasonable adjustments for field deviations or conditions encountered during the construction of Landlord's Work.

(d) Selection of Materials. Where more than one type of material or structure is indicated on the TI Construction Drawings approved by Landlord and Tenant, the option will be selected at Landlord's sole and absolute subjective discretion. As to all building materials and equipment that Landlord is obligated to supply under this Work Letter, Landlord shall select the manufacturer thereof in its sole and absolute subjective discretion.

(e) Delivery of the Premises. When Landlord's Work is Substantially Complete, subject to the remaining terms and provisions of this Section 3(e), Tenant shall accept the Premises. Tenant's taking possession and acceptance of the Premises shall not constitute a waiver of: (i) any warranty with respect to workmanship (including installation of equipment) or material (exclusive of equipment provided directly by manufacturers), (ii) any non-compliance of Landlord's Work with applicable Legal Requirements, or (iii) any claim that Landlord's Work was not completed substantially in accordance with the TI Construction Drawings (subject to Minor Variations and such other changes as are permitted hereunder) (collectively, a "**Construction Defect**"). Tenant shall have one year after Substantial Completion within which to notify Landlord of any such Construction Defect discovered by Tenant, and Landlord shall use reasonable efforts to remedy or cause the responsible contractor to remedy any such Construction Defect within 30 days thereafter. Notwithstanding the foregoing, Landlord shall not be in default under the Lease if the applicable contractor, despite Landlord's reasonable efforts, fails to remedy such Construction Defect within such 30-day period, in which case Landlord shall have no further obligation with respect to such Construction Defect other than to cooperate, at no cost to Landlord, with Tenant should Tenant elect to pursue a claim against such contractor.

(f) Tenant shall be entitled to receive the benefit of all construction warranties and manufacturer's equipment warranties relating to equipment installed in the Premises. If requested by Tenant, Landlord shall attempt to obtain extended warranties from manufacturers and suppliers of such equipment, but the cost of any such extended warranties shall be borne solely by Tenant. Landlord shall promptly undertake and complete, or cause to be completed, all punch list items.

(g) Commencement Date Delay. Except as otherwise provided in the Lease, Delivery of the Premises shall occur when Landlord's Work has been Substantially Completed, except to the extent that completion of Landlord's Work shall have been actually delayed by any one or more of the following causes ("**Tenant Delay**"):

(i) Tenant's Representative was not available within 1 business day to give or receive any Communication or to take any other action required to be taken by Tenant hereunder;

(ii) Tenant's request for Change Requests (as defined in Section 4(a) below) whether or not any such Change Requests are actually performed;

(iii) Construction of any Change Requests;

(iv) Tenant's request for materials, finishes or installations requiring unusually long lead times, Tenant's request for materials, finishes or installations requiring unusually long lead times, provided that promptly after Landlord learns of such long lead times, Landlord informs Tenant that the requested items will require unusually long lead times;

(v) Tenant's delay in reviewing, revising or approving plans and specifications beyond the periods set forth herein;

(vi) Tenant's delay in providing information critical to the normal progression of the Project. Tenant shall provide such information as soon as reasonably possible, but in no event longer than one week after receipt of any request for such information from Landlord;

(vii) Tenant's delay in making payments to Landlord for Excess TI Costs (as defined in Section 5(b) below); or

(viii) Any other act or omission by Tenant or any Tenant Party (as defined in the Lease), or persons employed by any of such persons.

If Delivery is delayed for any of the foregoing reasons, then Landlord shall cause the TI Architect to certify the date on which the Tenant Improvements would have been completed but for such Tenant Delay and such certified date shall be the date of Delivery.

4. **Changes**. Any changes requested by Tenant to the Tenant Improvements after the delivery and approval by Landlord of the Space Plan shall be requested and instituted in accordance with the provisions of this Section 4 and shall be subject to the written approval of Landlord and the TI Architect, such approval not to be unreasonably withheld, conditioned or delayed.

(a) **Tenant's Request For Changes**. If Tenant shall request changes to the Tenant Improvements ("**Changes**"), Tenant shall request such Changes by notifying Landlord in writing in substantially the same form as the AIA standard change order form (a "**Change Request**"), which Change Request shall detail the nature and extent of any such Change. Such Change Request must be signed by Tenant's Representative. Landlord shall, before proceeding with any Change, use commercially reasonable efforts to respond to Tenant as soon as is reasonably possible with an estimate of: (i) the time it will take, and (ii) the architectural and engineering fees and costs that will be incurred, to analyze such Change Request (which costs shall be paid by Tenant to the extent actually incurred, whether or not such change is implemented). Landlord shall thereafter submit to Tenant in writing, within 5 business days of receipt of the Change Request (or such longer period of time as is reasonably required depending on the extent of the Change Request), an analysis of the additional cost or savings involved, including, without limitation, architectural and engineering costs and the period of time, if any, that the Change will extend the date on which Landlord's Work will be Substantially Complete. Any such delay in the completion of Landlord's Work caused by a Change, including any suspension of Landlord's Work while any such Change is being evaluated and/or designed, shall be Tenant Delay.

(b) **Implementation of Changes**. If Tenant: (i) approves in writing the cost or savings and the estimated extension in the time for completion of Landlord's Work, if any, and (ii) deposits with Landlord any Excess TI Costs required in connection with such Change, Landlord shall cause the approved Change to be instituted. Notwithstanding any approval or disapproval by Tenant of any estimate of the delay caused by such proposed Change, the TI Architect's determination of the amount of Tenant Delay in connection with such Change shall be final and binding on Landlord and Tenant.

5. **Costs**.

(a) **TI Costs**. Landlord shall be responsible for the payment of design, permits and construction costs in connection with the construction of the Tenant Improvements, including, without limitation, the cost of preparing the TI Construction Drawings and the Space Plans, Landlord's out-of-pocket expenses and a cabling allowance of $3.00 per rentable square foot of the Premises (collectively, "TI Costs"). Notwithstanding anything to the contrary contained herein, except for the cabling allowance of $3.00 per rentable square foot of the Premises, Landlord shall not be required to pay for purchase any furniture, personal property or other non-Building system materials or equipment, including, but not limited to, Tenant's voice or data cabling, non-ducted biological safety cabinets and other scientific equipment not incorporated into the Tenant Improvements.

(b) **Excess TI Costs**. Notwithstanding anything to the contrary contained herein, Tenant acknowledges and agrees that Landlord shall have no responsibility for any costs arising from or related to Tenant's changes to the Space Plan or TI Construction Drawings, Tenant Delays, the cost of Changes and Change Requests (collectively, "**Excess TI Costs**"). Tenant shall deposit with Landlord, as a condition precedent to Landlord's obligation to complete the Tenant Improvements, 100% of the Excess

TI Costs. If Tenant fails to deposit any Excess TI Costs with Landlord, Landlord shall have all of the rights and remedies set forth in the Lease for nonpayment of Rent (including, but not limited to, the right to interest at the Default Rate and the right to assess a late charge). For purposes of any litigation instituted with regard to such amounts, those amounts will be deemed Rent under the Lease.

6. **Tenant Access.**

(a) **Tenant's Access Rights.** Landlord hereby agrees to permit Tenant access, at Tenant's sole risk and expense, to the Building (i) 30 days prior to the Commencement Date to perform any work **("Tenant's Work")** required by Tenant other than Landlord's Work, provided that such Tenant's Work is coordinated with the TI Architect and the general contractor, and complies with the Lease and all other reasonable restrictions and conditions Landlord may impose, and (ii) prior to the completion of Landlord's Work, to inspect and observe work in process; all such access shall be during normal business hours or at such other times as are reasonably designated by Landlord. Notwithstanding the foregoing, Tenant shall have no right to enter onto the Premises or the Project unless and until Tenant shall deliver to Landlord evidence reasonably satisfactory to Landlord demonstrating that any insurance reasonably required by Landlord in connection with such pre-commencement access (including, but not limited to, any insurance that Landlord may require pursuant to the Lease) is in full force and effect. Any entry by Tenant shall comply with all established safety practices of Landlord's contractor and Landlord until completion of Landlord's Work and acceptance thereof by Tenant.

(b) **No Interference.** Neither Tenant nor any Tenant Party (as defined in the Lease) shall interfere with the performance of Landlord's Work, nor with any inspections or issuance of final approvals by applicable Governmental Authorities, and upon any such interference, Landlord shall have the right to exclude Tenant and any Tenant Party from the Premises and the Project until Substantial Completion of Landlord's Work or such earlier time that Tenant or Tenant Party's presence at the Premises will not interfere with Landlord's Work.

(c) **No Acceptance of Premises.** The fact that Tenant may, with Landlord's consent, enter into the Project prior to the date Landlord's Work is Substantially Complete for the purpose of performing Tenant's Work shall not be deemed an acceptance by Tenant of possession of the Premises, but in such event Tenant shall defend with counsel reasonably acceptable by Landlord, indemnify and hold Landlord harmless from and against any loss of or damage to Tenant's property, completed work, fixtures, equipment, materials or merchandise, and from liability for death of, or injury to, any person, caused by the act or omission of Tenant or any Tenant Party.

7. **Miscellaneous.**

(a) **Consents.** Whenever consent or approval of either party is required under this Work Letter, that party shall not unreasonably withhold, condition or delay such consent or approval, unless expressly set forth herein to the contrary.

(b) **Modification.** No modification, waiver or amendment of this Work Letter or of any of its conditions or provisions shall be binding upon Landlord or Tenant unless in writing signed by Landlord and Tenant.

EXHIBIT D TO LEASE

ACKNOWLEDGMENT OF COMMENCEMENT DATE

This **ACKNOWLEDGMENT OF COMMENCEMENT DATE** is made this _____ day of _____, _____, between **ARE-SEATTLE NO. 11, LLC,** a Delaware limited liability company **("Landlord"),** and **ADAPTIVE TCR CORPORATION,** a Washington corporation **("Tenant"),** and is attached to and made a part of the Lease dated _____, 2011 (the **"Lease"),** by and between Landlord and Tenant. Any initially capitalized terms used but not defined herein shall have the meanings given them in the Lease.

Landlord and Tenant hereby acknowledge and agree, for all purposes of the Lease, that the Commencement Date of the Base Term of the Lease is _____, _____, the Rent Commencement Date is _____, _____, and the termination date of the Base Term of the Lease shall be midnight on _____, _____, In case of a conflict between the terms of the Lease and the terms of this Acknowledgment of Commencement Date, this Acknowledgment of Commencement Date shall control for all purposes.

IN WITNESS WHEREOF, Landlord and Tenant have executed this ACKNOWLEDGMENT OF COMMENCEMENT DATE to be effective on the date first above written.

TENANT:

ADAPTIVE TCR CORPORATION,
a Washington corporation

By: _____
Its: _____

LANDLORD:

ARE-SEATTLE NO. 11, LLC,
a Delaware limited liability company

By: ALEXANDRIA REAL ESTATE EQUITIES, L.P., a Delaware limited partnership, managing member

By: ARE-QRS CORP.,
a Maryland corporation,
general partner

By: _____
Its: _____

EXHIBIT E TO LEASE

Rules and Regulations

1. The sidewalk, entries, and driveways of the Project shall not be obstructed by Tenant, or any Tenant Party, or used by them for any purpose other than ingress and egress to and from the Premises.

2. Tenant shall not place any objects, including antennas, outdoor furniture, etc., in the parking areas, landscaped areas or other areas outside of its Premises, or on the roof of the Project.

3. Except for animals assisting the disabled, no animals shall be allowed in the offices, halls, or corridors in the Project.

4. Tenant shall not disturb the occupants of the Project or adjoining buildings by the use of any radio or musical instrument or by the making of loud or improper noises.

5. If Tenant desires telegraphic, telephonic or other electric connections in the Premises, Landlord or its agent will direct the electrician as to where and how the wires may be introduced; and, without such direction, no boring or cutting of wires will be permitted. Any such installation or connection shall be made at Tenant's expense.

6. Tenant shall not install or operate any steam or gas engine or boiler, or other mechanical apparatus in the Premises, except as specifically approved in the Lease. The use of oil, gas or inflammable liquids for heating, lighting or any other purpose is expressly prohibited. Explosives or other articles deemed extra hazardous shall not be brought into the Project.

7. Parking any type of recreational vehicles is specifically prohibited on or about the Project. Except for the overnight parking of operative vehicles, no vehicle of any type shall be stored in the parking areas at any time. In the event that a vehicle is disabled, it shall be removed within 48 hours. There shall be no "For Sale" or other advertising signs on or about any parked vehicle. All vehicles shall be parked in the designated parking areas in conformity with all signs and other markings. All parking will be open parking, and no reserved parking, numbering or lettering of individual spaces will be permitted except as specified by Landlord.

8. Tenant shall maintain the Premises free from rodents, insects and other pests.

9. Landlord reserves the right to exclude or expel from the Project any person who, in the judgment of Landlord, is intoxicated or under the influence of liquor or drugs or who shall in any manner do any act in violation of the Rules and Regulations of the Project.

10. Tenant shall not cause any unnecessary labor by reason of Tenant's carelessness or indifference in the preservation of good order and cleanliness. Landlord shall not be responsible to Tenant for any loss of property on the Premises, however occurring, or for any damage done to the effects of Tenant by the janitors or any other employee or person.

11. Tenant shall give Landlord prompt notice of any defects in the water, lawn sprinkler, sewage, gas pipes, electrical lights and fixtures, heating apparatus, or any other service equipment affecting the Premises.

12. Tenant shall not permit storage outside the Premises, including without limitation, outside storage of trucks and other vehicles, or dumping of waste or refuse or permit any harmful materials to be placed in any drainage system or sanitary system in or about the Premises.

13. All moveable trash receptacles provided by the trash disposal firm for the Premises must be kept in the trash enclosure areas, if any, provided for that purpose.

14. No auction, public or private, will be permitted on the Premises or the Project.

15. No awnings shall be placed over the windows in the Premises except with the prior written consent of Landlord.

16. The Premises shall not be used for lodging, sleeping or cooking or for any immoral or illegal purposes or for any purpose other than that specified in the Lease. No gaming devices shall be operated in the Premises.

17. Tenant shall ascertain from Landlord the maximum amount of electrical current which can safely be used in the Premises, taking into account the capacity of the electrical wiring in the Project and the Premises and the needs of other tenants, and shall not use more than such safe capacity. Landlord's consent to the installation of electric equipment shall not relieve Tenant from the obligation not to use more electricity than such safe capacity.

18. Tenant assumes full responsibility for protecting the Premises from theft, robbery and pilferage.

19. Tenant shall not install or operate on the Premises any machinery or mechanical devices of a nature not directly related to Tenant's ordinary use of the Premises and shall keep all such machinery free of vibration, noise and air waves which may be transmitted beyond the Premises.

EXHIBIT F TO LEASE

TENANT'S PERSONAL PROPERTY

None.

EXHIBIT G TO LEASE

ASBESTOS DISCLOSURE

NOTIFICATION OF THE PRESENCE OF ASBESTOS CONTAINING MATERIALS

This notification provides certain information about asbestos within or about the Premises at 1551 Eastlake Avenue, Seattle, WA ("Building") and in accordance with Washington Administrative Code, Chapter 296-62-07721.

Historically, asbestos was commonly used in building products used in the construction of buildings across the country. Asbestos-containing building products were used because they are fire-resistant and provide good noise and temperature insulation. Because of their prevalence, asbestos-containing materials, or ACMs, are still sometimes found in buildings today.

An asbestos survey of the Building has determined that ACMs and/or materials that might contain ACMs, referred to as presumed asbestos-containing materials or PACMs, are present within or about the Premises as follows:

Material Description	Material Location
Floor Mastic (not covered by floor tile)	Various locations within the parking garage
Flooring Material and Mastic beneath new floor tile (PACM)	Landings of stairwells #1 and #2

Because ACMs and PACMs are present and may continue to be present within or about the Building, we have hired an independent environmental consulting firm to prepare an operations and maintenance program **("O&M Program").** The O&M Program is designed to minimize the potential of any harmful asbestos exposure to any person within or about the Building. The O&M Program includes a description of work methods to be taken in order to maintain any ACMs or PACMs within or about the Building in good condition and to prevent any significant disturbance of such AGMs or PACMs. Appropriate personnel receive regular periodic training on how to properly administer the O&M Program.

The O&M Program describes the risks associated with asbestos exposure and how to prevent such exposure through appropriate work practices. ACMs and PACMs generally are not thought to be a threat to human health unless asbestos fibers are released into the air and inhaled. This does not typically occur unless (1) the ACMs are in a deteriorating condition, or (2) the ACMs have been significantly disturbed (such as through abrasive cleaning, or maintenance or renovation activities). If inhaled, asbestos fibers can accumulate in the lungs and, as exposure increases, the risk of disease (such as asbestosis or cancer) increases. However, measures to minimize exposure, and consequently minimize the accumulation of asbestos fibers, reduce the risks of adverse health effects.

The O&M Program describes a number of activities that should be avoided in order to prevent a release of asbestos fibers. In particular, you should be aware that some of the activities which may present a health risk include moving, drilling, boring, or otherwise disturbing ACMs. Consequently, such activities should not be attempted by any person not qualified to handle ACMs.

The O&M Program is available for review during regular business hours at our office located at 1600 Fairview Avenue East, Suite 100, Seattle WA 98102.

EXHIBIT H TO LEASE

EXPANSION SPACE

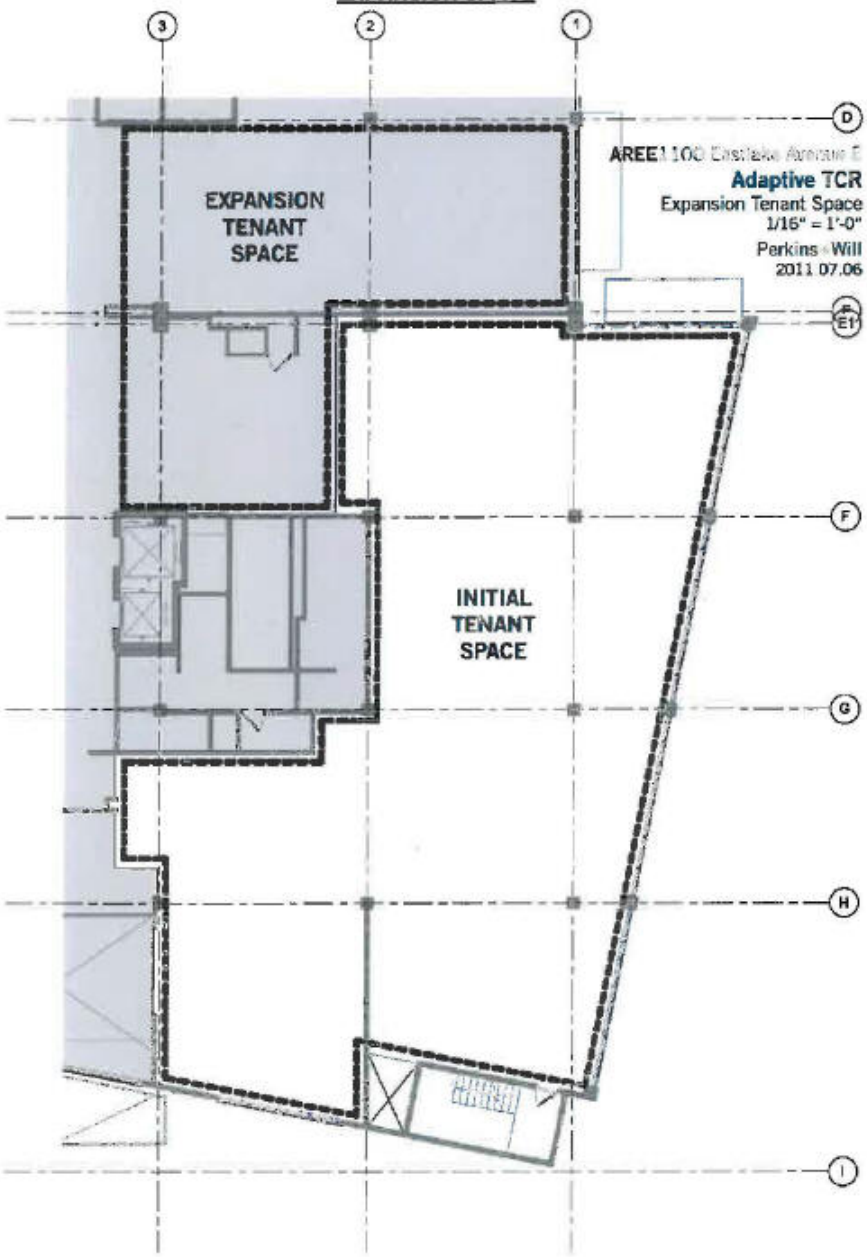
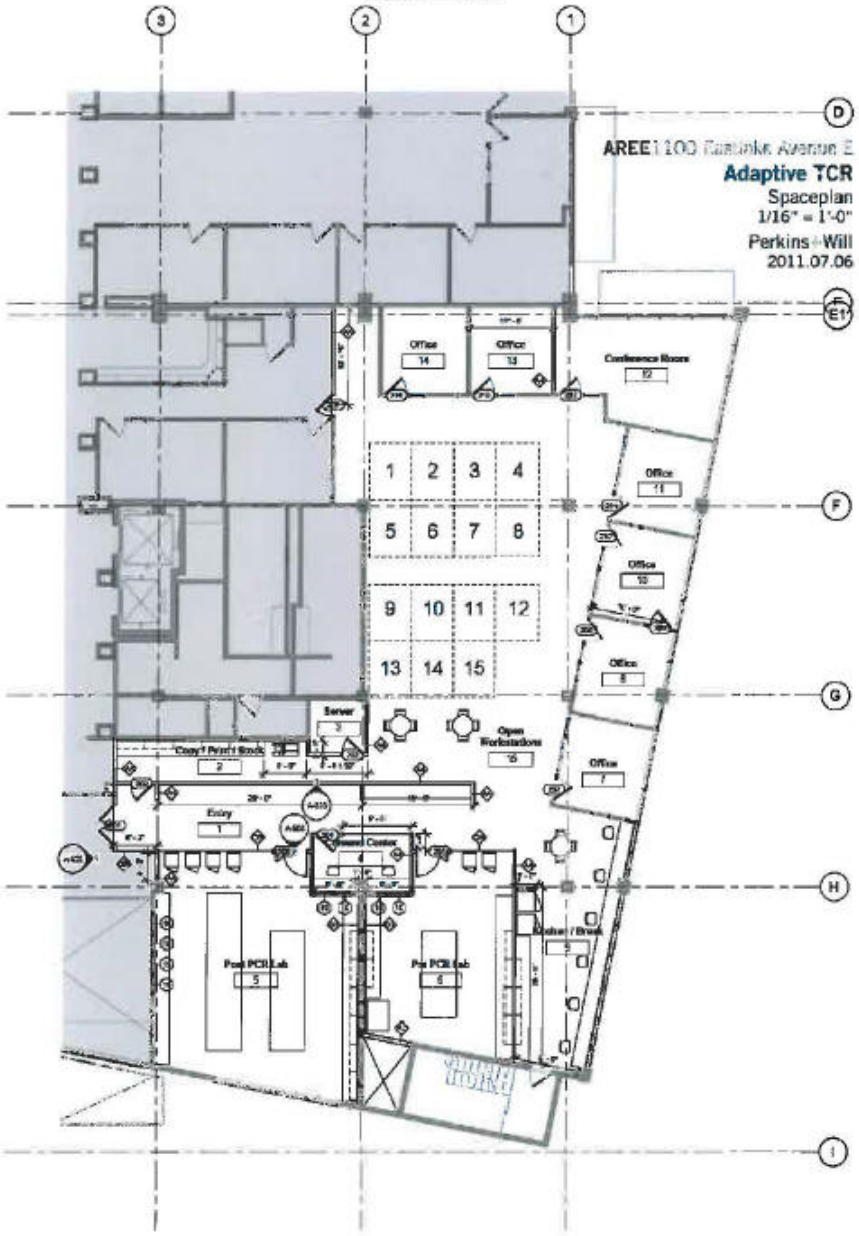


EXHIBIT I TO LEASE

SPACE PLAN



FIRST AMENDMENT TO LEASE

THIS FIRST AMENDMENT TO LEASE (this "**First Amendment**") is made as of August 26, 2011, by and between **ARE-SEATTLE NO. 11, LLC**, a Delaware limited liability company ("**Landlord**"), and **ADAPTIVE TCR CORPORATION**, a Washington corporation ("**Tenant**").

RECITALS

A. Landlord and Tenant are now parties to that certain Lease dated as of July 21, 2011 (the "**Lease**"). Pursuant to the Lease, Tenant leases certain premises ("**Premises**") consisting of approximately 7,724 rentable square feet in a building located at 1551 Eastlake Avenue, Seattle, Washington ("**Building**"). The Premises are more particularly described in the Lease. Capitalized terms used herein without definition shall have the meanings defined for such terms in the Lease.

B. Landlord and Tenant desire to amend the Lease subject to the terms and conditions set forth below.

NOW, THEREFORE, in consideration of the foregoing Recitals, which are incorporated herein by this reference, the mutual promises and conditions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Landlord and Tenant hereby agree as follows:

1. **Sales Tax Deferral/Exemption**.

(a) Landlord has advised Tenant that Retail sales tax otherwise applicable to portions of construction of the Tenant Improvements may be eligible for deferral pursuant to RCW 82.63 (the "**Sales Tax Deferral**") as a result of Tenant's intended use of the Premises. Tenant has advised Landlord that Tenant intends to conduct biotechnology research and development in the Premises. Landlord believes that approximately 60% of Tenant's Premises will qualify for a Sales Tax Deferral, for the cost of construction of the Tenant Improvements. The Base Rent under this Lease reflects Tenant's receipt of the benefit of this Sales Tax Deferral in the form of a lower Base Rent. Promptly following the execution of this Lease, Landlord shall prepare and process applications with the Washington State Department of Revenue for a deferral of state and local sales and use taxes with respect to the construction of the Tenant Improvements. Tenant shall, at Landlord's sole cost and expense, cooperate with Landlord's preparation and processing of such applications. Landlord shall notify Tenant in writing once the Sales Tax Deferral has been granted by the Department of Revenue. If the retail sales tax for any of the Tenant Improvements requested by Landlord is deferred, and if, for any reason, other than Tenant's failure to complete the annual survey required by RCW 82.63.020, any part of the retail sales tax so deferred is subsequently required to be repaid, Landlord shall promptly pay the same, together with any interest, penalties, or other charges that are or become due in connection therewith, and Landlord shall indemnify and hold Tenant harmless from any and all costs, expenses, losses, damages, liability and claims arising out of or related to any retail sales tax deferral for the Tenant Improvements. If any part of the Sales Tax Deferral is required to be repaid because Tenant failed to complete the annual survey required by RCW 82.63.020, Tenant shall promptly pay the same, together with any interest, penalties or other charges that are or become due in connection therewith, and Tenant shall indemnify and hold Landlord harmless from any and all costs, expenses, loss, damages, liability and claims arising out of or related to such loss of the Sales Tax Deferral.

(b) Tenant shall on an annual basis report to Landlord the nature of Tenant's use of the Premises and the extent to which such use does not qualify for the Sales Tax Deferral and complete the annual survey required by RCW 82.63.020. Tenant shall, after consultation with Landlord, be responsible for reporting any non-qualifying use to the State of Washington Department of Revenue and shall deliver copies of the same to Landlord concurrently with its

delivery of the same to the State of Washington Department of Revenue. Landlord acknowledges and agrees that, as between Landlord and Tenant, Landlord shall be solely responsible for paying for any tax resulting from any non-qualifying use.

(c) Tenant will, at Landlord's sole cost and expense, reasonably cooperate with and assist Landlord in any challenges or audits to the Sales Tax Deferral benefit. In any contest regarding the Sales Tax Deferral benefit, Landlord shall be the main contact with the Department of Revenue; provided, however, that Landlord shall promptly provide Tenant with copies of any correspondence between Landlord and the Department of Revenue and Tenant shall have the right to be present at any and all meetings or proceedings relating to any such contest. Landlord and Tenant shall promptly notify each other of any such challenges or audits that they become aware of and will promptly forward to one another any correspondence regarding any such challenge or audit. Landlord shall have the right to contest or review any proceedings regarding the Sales Tax Deferral benefit, which may be instituted either during or after the Term of this Lease. Tenant will on a timely basis execute all reasonably necessary instruments submitted by Landlord to Tenant for execution in connection with any such protest, appeal or other proceedings, provided, however, that the same are reasonably acceptable to Tenant. If any proceeding may only be instituted and maintained by Tenant, then Tenant shall do so at Landlord's cost and expense upon the request of Landlord. Tenant shall not settle any appeal or other proceeding with respect to such Sales Tax Deferral without obtaining Landlord's prior written approval in each instance (not to be unreasonably withheld, conditioned or delayed). Landlord shall be entitled to any resulting refund obtained by reason of any such proceeding or otherwise, whether obtained during or after the expiration of the Term and whether obtained by Landlord or Tenant. Landlord shall indemnify and hold Tenant harmless from any and all costs, expenses, losses, damages, liability and claims arising out of or related to Tenant's compliance with the provisions of this Section 1(c), including, without limitation, as a result of the execution of any instruments provided to Tenant by Landlord for execution.

2. **Miscellaneous**.

a. This First Amendment is the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior and contemporaneous oral and written agreements and discussions. This First Amendment may be amended only by an agreement in writing, signed by the parties hereto.

b. This First Amendment is binding upon and shall inure to the benefit of the parties hereto, their respective agents, employees, representatives, officers, directors, divisions, subsidiaries, affiliates, assigns, heirs, successors in interest and shareholders.

c. This First Amendment may be executed in any number of counterparts, each of which shall be deemed an original, but all of which when taken together shall constitute one and the same instrument. The signature page of any counterpart may be detached therefrom without impairing the legal effect of the signature(s) thereon provided such signature page is attached to any other counterpart identical thereto except having additional signature pages executed by other parties to this First Amendment attached thereto.

d. Except as amended and/or modified by this First Amendment, the Lease is hereby ratified and confirmed and all other terms of the Lease shall remain in full force and effect, unaltered and unchanged by this First Amendment. In the event of any conflict between the provisions of this First Amendment and the provisions of the Lease, the provisions of this First Amendment shall prevail. Whether or not specifically amended by this First Amendment, all of the terms and provisions of the Lease are hereby amended to the extent necessary to give effect to the purpose and intent of this First Amendment.

[**Signatures are on the next page**.]

IN WITNESS WHEREOF, the parties hereto have executed this First Amendment as of the day and year first above written.

TENANT:

ADAPTIVE TCR CORPORATION,
a Washington corporation

By: /s/ Chad Robins
Its: President & CEO

LANDLORD:

ARE-SEATTLE NO. 11, LLC,
a Delaware limited liability company

By: ALEXANDRIA REAL ESTATE EQUITIES, L.P., a Delaware limited partnership,
managing member

By: ARE-QRS CORP.,
a Maryland corporation,
general partner

By: /s/ Jennifer Pappas
Its: SVP - GENERAL COUNSEL

AMENDED AND RESTATED SECOND AMENDMENT TO LEASE

THIS AMENDED AND RESTATED SECOND AMENDMENT TO LEASE AMENDS, RESTATES AND SUPERSEDES IN ITS ENTIRETY THAT CERTAIN SECOND AMENDMENT TO LEASE DATED AS OF MARCH 31, 2014, BY AND BETWEEN TENANT (AS DEFINED BELOW) AND LANDLORD (AS DEFINED BELOW).

THIS AMENDED AND RESTATED SECOND AMENDMENT TO LEASE (this "**Second Amendment**") is made as of June 30, 2014, by and between **ARE-SEATTLE NO. 11, LLC**, a Delaware limited liability company ("**Landlord**"), and **ADAPTIVE BIOTECHNOLOGIES CORPORATION**, a Washington corporation ("**Tenant**").

RECITALS

A. Landlord and Tenant are now parties to that certain Lease Agreement dated as of July 21, 2011 ("**Original Lease**"), as amended by that certain First Amendment to Lease dated as of August 26, 2011 (as amended, the "**Lease**"). Pursuant to the Lease, Tenant leases certain premises ("**Original Premises**") located on the second floor, as shown on **Exhibit A** to the Original Lease, of that certain building located at 1551 Eastlake Avenue, Seattle, Washington. The Original Premises are more particularly described in the Lease. Capitalized terms used herein without definition shall have the meanings defined for such terms in the Lease.

B. Landlord and Tenant desire, subject to the terms and conditions set forth below, to amend the Lease to, among other things, (i) expand the size of the Original Premises by adding that certain portion of the second floor of the Building shown on **Exhibit A** attached to this Second Amendment ("**Expansion Premises**"), and (ii) extend the Base Term of the Lease.

NOW, THEREFORE, in consideration of the foregoing Recitals, which are incorporated herein by this reference, the mutual promises and conditions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Landlord and Tenant hereby agree as follows:

1. **Expansion Premises**. In addition to the Original Premises, commencing on the Expansion Premises Commencement Date (as defined below), Landlord leases to Tenant, and Tenant leases from Landlord, the Expansion Premises.

2. **Delivery**. Landlord shall use reasonable efforts to deliver possession of the Expansion Premises to Tenant with Landlord's Work Substantially Completed ("**Delivery**" or "**Deliver**") on or before the Target Expansion Premises Commencement Date. The "**Target Expansion Premises Commencement Date**" shall be December 1, 2014. If Landlord fails to timely Deliver the Expansion Premises, Landlord shall not be liable to Tenant for any loss or damage resulting therefrom, and the Lease with respect to the Expansion Premises shall not be void or voidable, except as otherwise provided in this paragraph. If Landlord does not Deliver the Expansion Premises within 90 days of the Target Expansion Premises Commencement Date for any reason other than Force Majeure delays and Tenant Delays, the Lease with respect to the Expansion Premises only may be terminated by Tenant by written notice to Landlord, and if so terminated by Tenant: (a) all of the provisions of this Second Amendment shall terminate and be of no further force or effect, and (b) neither Landlord nor Tenant shall have any further rights, duties or obligations under the Lease with respect to the Expansion Premises, except with respect to provisions which expressly survive termination of the Lease. As used herein, the terms "**Landlord's Work**," "**Tenant Delays**" and "**Substantially Completed**" shall have the meanings set forth for such terms in the Expansion Premises Work Letter attached to this Second Amendment as **Exhibit B.**

The "**Expansion Premises Commencement Date**" shall be the earlier of: (i) the date Landlord Delivers the Expansion Premises to Tenant; or (ii) the date Landlord could have Delivered the Expansion Premises but for Tenant Delays. The "**Expansion Premises Rent Commencement Date**" shall be the date that is 4 months after the Expansion Premises Commencement Date. Upon the request of Landlord, Tenant shall execute and deliver a written acknowledgment of the Expansion Premises Commencement Date, the Expansion Premises Rent Commencement Date and the expiration date of the Lease in substantially the form of the "Acknowledgement of Commencement Date" attached to the Lease as **Exhibit D**; provided, however, Tenant's failure to execute and deliver such acknowledgment shall not affect Landlord's rights hereunder.

Except as set forth in the Expansion Premises Work Letter: (i) Tenant shall accept the Expansion Premises in their condition as of the Expansion Premises Commencement Date, subject to all applicable Legal Requirements; (ii) Landlord shall have no obligation for any defects in the Expansion Premises; and (iii) Tenant's taking possession of the Expansion Premises shall be conclusive evidence that Tenant accepts the Expansion Premises and that the Expansion Premises were in good condition at the time possession was taken.

Tenant agrees and acknowledges that neither Landlord nor any agent of Landlord has made any representation or warranty with respect to the condition of all or any portion of the Expansion Premises, and/or the suitability of the Expansion Premises for the conduct of Tenant's business, and Tenant waives any implied warranty that the Expansion Premises are suitable for the Permitted Use.

3. **Premises and Rentable Area of Premises**. Commencing on the Expansion Premises Commencement Date, the defined terms "**Premises**" and "**Rentable Area of Premises**" on page 1 of the Lease shall be deleted in their entirety and replaced with the following:

> "**Premises**: That portion of the second floor of the Project containing approximately 20,324 rentable square feet, consisting of the "**Original Premises**" and the "**Expansion Premises**", all as shown on **Exhibit A**."
>
> "**Rentable Area of Premises**: 20,324 sq. ft."

As of the Expansion Premises Commencement Date, **Exhibit A** to the Lease shall be amended to include the Expansion Premises as shown on **Exhibit A** attached to this Second Amendment.

The rentable square footage of the Premises (the Original Premises and the Expansion Premises) has been determined in accordance with the BOMA 2010 Standard Methods of Measurement for multi-tenant buildings.

4. **Base Term**. Commencing on the Expansion Premises Commencement Date, the defined term "**Base Term**" on page 1 of the Lease is deleted in its entirety and replaced with the following:

> "**Base Term**: Commencing (i) with respect to the Original Premises on the Commencement Date, and (ii) with respect to the Expansion Premises on the Expansion Premises Commencement Date and ending with respect to the entire Premises on the date that is 64 months from the first day of the first full month after the Expansion Premises Commencement Date."

5. **Base Rent**.

a. Original Premises. Tenant shall continue to pay Base Rent for the Original Premises as provided for in the Lease through September 30, 2017. Thereafter, Base Rent payable for the Original Premises shall continue to increase on each Adjustment Date (as defined in Section 4 of the Lease) pursuant to the terms of Section 4 of the Lease.

b. Expansion Premises. Commencing on the Expansion Premises Rent Commencement Date (i.e., the date that is 4 months after the Expansion Premises Commencement Date), Tenant shall pay Base Rent for the Expansion Premises at the rate of $46.00 per rentable square foot of the Expansion Premises per year. Base Rent payable for the Expansion Premises shall be increased (i) on the earlier of (x) the first Adjustment Date to occur following the Expansion Premises Commencement Date, or (y) the first anniversary of the Expansion Premises Commencement Date (either, the "**First Expansion Premises Adjustment Date**"), and thereafter (ii) on each annual anniversary of the First Expansion Premises Adjustment Date (each, an "**Expansion Premises Adjustment Date**"), by multiplying the Base Rent payable with respect to the Expansion Premises immediately before the First Expansion Premises Adjustment Date or Expansion Premises Adjustment Date, as applicable, by 2.5% and adding the resulting amount to the Base Rent payable with respect to the Expansion Premises immediately before the First Expansion Premises Adjustment Date or Expansion Premises Adjustment Date, as applicable.

Notwithstanding anything to the contrary contained herein, with respect to the Expansion Premises only, for the period commencing on the Expansion Premises Rent Commencement Date through the last day.of the 6th month after the Expansion Premises Commencement Date, Tenant shall be required to pay Base Rent with respect to only 4,027.5 rentable square feet of the Expansion Premises. Commencing on the first day of the 7th month after the Expansion Premises Commencement Date, Tenant shall commence paying Base Rent with respect to the entire Expansion Premises.

6. **Tenant's Share**. Commencing on the Expansion Premises Commencement Date, the defined term "**Tenant's Share of Operating Expenses**" on page 1 of the Lease shall be deleted in its entirety and replaced with the following'

"**Tenant's Share of Operating Expenses**: 17.30%"

7. **Parking**. Subject to all matters of record, Force Majeure, a Taking and the exercise by Landlord of its rights hereunder, Landlord shall make available to Tenant and Tenant shall be entitled to use, at no additional cost, an addition 15 parking spaces ("**Expansion Premises Parking Spaces**"), which Expansion Premises Parking Spaces shall all be located in the non-reserved parking areas of the Off-Site Parking (as defined in Section 10 of the Original Lease), as may be modified by Landlord from time to time, subject in each case to Landlord's rules and regulations. Landlord may allocate parking spaces among Tenant and other tenants in the Project if Landlord determines that such parking facilities are becoming crowded, Landlord shall not be responsible for enforcing Tenant's parking rights against any third parties, including other tenants of the Project.

8. **Extension Right**. For the avoidance of doubt, commencing on the Expansion Premises Commencement Date, Tenant's Extension Right pursuant to Section 40 of the Lease shall apply with respect to the Expansion Premises, and such Extension Right may only be exercised concurrently with respect to both the Original Premises and the Expansion Premises.

9. **Expansion Premises**. Section 39 of the Lease is hereby deleted in its entirety and is of no further force or effect.

10. **Right to Terminate**. Section 41 of the Lease is hereby deleted in its entirety and is of no further force or effect.

11. **Asbestos**.

a. Notification of Asbestos. Landlord hereby notifies Tenant of the presence of asbestos-containing materials ("**ACMs**") and/or presumed asbestos-containing materials ("**PACMs**") within or about the Premises in the location identified in **Exhibit C** attached to this First Amendment.

b. Tenant Acknowledgement. Tenant hereby acknowledges receipt of the notification in paragraph (a) of this Section 11 and understands that the purpose of such notification is to make Tenant and any agents, employees, and contractors of Tenant, aware of the presence of ACMs and/or PACMs within or about the Building in order to avoid or minimize any damage to or disturbance of such ACMs and/or PACMs.

CMR
Tenant's Initials

c. Acknowledgement from Contractors/Employees. Tenant shall give Landlord at least 14 days' prior written notice before conducting, authorizing or permitting any of the activities listed below within or about the Premises, and before soliciting bids from any person to perform such services. Such notice shall identify or describe the proposed scope, location, date and time of such activities and the name, address and telephone number of each person who may be conducting such activities. Thereafter, Tenant shall grant Landlord reasonable access to the Premises to determine whether any ACMs or PACMs will be disturbed in connection with such activities. Tenant shall not solicit bids from any person for the performance of such activities without Landlord's prior written approval. Upon Landlord's request, Tenant shall deliver to Landlord a copy of a signed acknowledgement from any contractor, agent, or employee of Tenant acknowledging receipt of information describing the presence of ACMs and/or PACMs within or about the Premises in the locations identified in **Exhibit C** prior to the commencement of such activities. Nothing in this Section 11 shall be deemed to expand Tenant's rights under the Lease or otherwise to conduct, authorize or permit any such activities.

(i) Removal of thermal system insulation ("**TSI**") and surfacing ACMs and PACMs (i.e., sprayed-on or troweled-on material, e.g., textured ceiling paint or fireproofing material);

(ii) Removal of ACMs or PACMs that are not TSI or surfacing ACMs or PACMs; or

(iii) Repair and maintenance of operations that are likely to disturb ACMs or PACMs.

12. **Brokers**. Landlord and Tenant each represents and warrants that it has not dealt with any broker, agent or other person (collectively, "**Broker**") in connection with the transaction reflected in this Second Amendment and that no Broker brought about this transaction, other than Cushman & Wakefield Commerce and Flinn Ferguson. Landlord and Tenant each hereby agrees to indemnify and hold the other harmless from and against any claims by any Broker claiming a commission or other form of compensation by virtue of having dealt with Tenant or Landlord, as applicable, with regard to this Second Amendment. Landlord shall be responsible for all commissions due to Cushman & Wakefield Commerce and Flinn Ferguson arising out of the execution of this Second Amendment in accordance with the terms of separate written agreements between Landlord, on the one hand, and Cushman & Wakefield Commerce and Flinn Ferguson, on the other hand.

13. **Miscellaneous**.

a. This Second Amendment is the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior and contemporaneous oral and written agreements and discussions. This Second Amendment may be amended only by an agreement in writing, signed by the parties hereto.

b. This Second Amendment is binding upon and shall inure to the benefit of the parties hereto, and their respective successors and assigns.

c. This Second Amendment may be executed in any number of counterparts, each of which shall be deemed an original, but all of which when taken together shall constitute one and the same instrument. The signature page of any counterpart may be detached therefrom without impairing the legal effect of the signature(s) thereon provided such signature page is attached to any other counterpart identical thereto except having additional signature pages executed by other parties to this Second Amendment attached thereto.

d. Except as amended and/or modified by this Second Amendment, the Lease is hereby ratified and confirmed and all other terms of the Lease shall remain in full force and effect, unaltered and unchanged by this Second Amendment. In the event of any conflict between the provisions of this Second Amendment and the provisions of the Lease, the provisions of this Second Amendment shall prevail. Whether or not specifically amended by this Second Amendment, all of the terms and provisions of the Lease are hereby amended to the extent necessary to give effect to the purpose and intent of this Second Amendment.

[**Signatures are on the next page**.]

IN WITNESS WHEREOF, the parties hereto have executed this Second Amendment as of the day and year first above written.

TENANT:

ADAPTIVE BIOTECHNOLOGIES CORPORATION,
a Washington corporation

Chad Robins

By: /s/ Chad Robins
Its: CEO & President

LANDLORD:

ARE-SEATTLE NO. 11, LLC,
a Delaware limited liability company

By: ALEXANDRIA REAL ESTATE EQUITIES, L.P., a Delaware limited partnership,
managing member

By: ARE-QRS CORP.,
a Maryland corporation,
general partner

By: /s/ Jackie Clem
Its: VP Real Estate Legal Affairs

LANDLORD'S ACKNOWLEDGMENT

State of California }

County of Los Angeles

On June 30 2014 before me, Charles L. Murphy, Notary Public
Date Here Insert Name and Title of the Officer

personally appeared Jackie Stern
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____
Signature of Notary Public

CHARLES L. MURPHY
Commission # 1941763
Notary Public - California
Los Angeles County
My Comm. Expires Jul 20, 2015

Place Notary Seal Above

TENANT'S ACKNOWLEDGMENT

STATE OF Washington
COUNTY OF King | ss.

On this 30th day of June, 2014, before me personally appeared Chad Robins to me known to be the CEO & President of Adaptive Biotechnologies Corp a Washington State corporation that executed the within and foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation for the uses and purposes therein mentioned, and on oath stated that they were authorized to execute said instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

HEATHER JANET CRAG NOTARY PUBLIC STATE OF WASHINGTON COMMISSION EXPIRES 2-19-17

(Signature of Notary)

Heather J. Craig
(Legibly Print or Stamp Name of Notary)

Notary public in and for the State of Washington, residing at Seattle, WA

My appointment expires Feb. 19, 2017

EXHIBIT A

The Expansion Premises

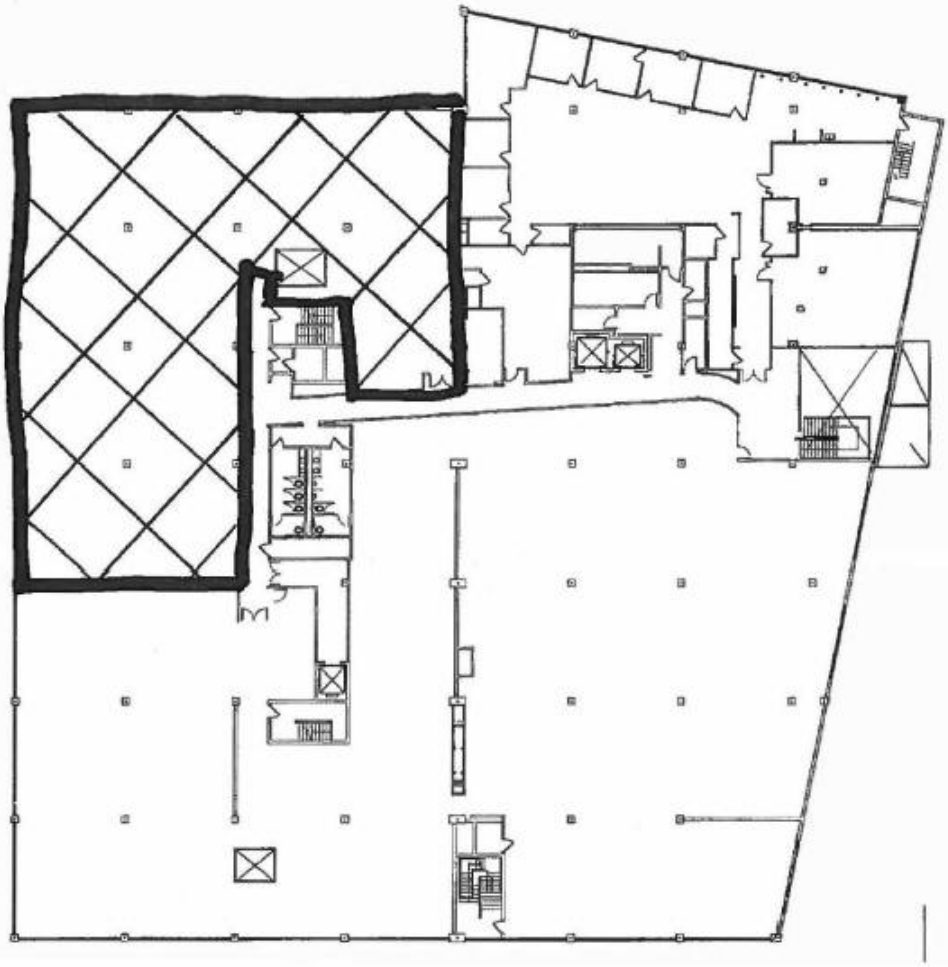


EXHIBIT B

Expansion Premises Work Letter

THIS EXPANSION PREMISES WORK LETTER dated June 30, 2014 (this "**Expansion Premises Work Letter**") is made and entered into by and between **ARE-SEATTLE NO. 11, LLC**, a Delaware limited liability company ("**Landlord**"), and **ADAPTIVE BIOTECHNOLOGIES CORPORATION**, a Washington corporation ("**Tenant**"), and is attached to and made a part of the Lease Agreement dated July 21, 2011, as amended by that certain First Amendment to Lease dated as of August 26, 2011, and as further amended by that certain Amended and Restated Second Amendment to Lease dated of even date herewith (as amended, the "**Lease**"), by and between Landlord and Tenant. Any initially capitalized terms used but not defined herein shall have the meanings given them in the Lease.

1. **General Requirements**.

(a) **Tenant's Authorized Representative**. Tenant designates Chad Robins ("**Tenant's Representative**") as the only person authorized to act for Tenant pursuant to this Work Letter. Landlord shall not be obligated to respond to or act upon any request, approval, inquiry or other communication ("**Communication**") from or on behalf of Tenant in connection with this Work Letter unless such Communication is in writing from Tenant's Representative. Tenant may change Tenant's Representative at any time upon not less than 5 business days advance written notice to Landlord.

(b) **Landlord's Authorized Representative**. Landlord designates John Cox ("**Landlord's Representative**") as the only person authorized to act for Landlord pursuant to this Expansion Premises Work Letter. Tenant shall not be obligated to respond to or act upon any request, approval, inquiry or other Communication from or on behalf of Landlord in connection with this Expansion Premises Work Letter unless such Communication is in writing from Landlord's Representative. Landlord may change Landlord's Representative at any time upon not less than 5 business days advance written notice to Tenant. Landlord's Representative shall be the sole persons authorized to direct Landlord's contractors in the performance of Landlord's Work,

(c) **Architects, Consultants and Contractors**. Landlord and Tenant hereby acknowledge and agree that: (i) the general contractor and any subcontractors for the Tenant Improvements shall be selected by Landlord, subject to Tenant's approval, which approval shall not be unreasonably withheld. conditioned or delayed, and (ii) Perkins + Will shall be the architect (the "**TI Architect**") for the Tenant Improvements.

2. **Tenant Improvements**.

(a) **Tenant Improvements Defined**. As used herein, "**Tenant Improvements**" shall mean all improvements to the Expansion Premises of a fixed and permanent nature as shown on the TI Construction Drawings, as defined in Section 2(c) below. Other than Landlord's Work (as defined in Section 3(a) below, Landlord shall not have any obligation whatsoever with respect to the finishing of the Expansion Premises for Tenant's use and occupancy.

(b) **Tenant's Space Plans**. Landlord and Tenant acknowledge and agree that the plan prepared by the TI Architect attached to this Expansion Premises Work Letter as **Schedule 1** (the "**Space Plan**") has been approved by both Landlord and Tenant. Landlord and Tenant further acknowledge and agree that any changes to the Space Plan constitute a Change Request the cost of which changes shall be paid for by Tenant. Tenant shall be solely responsible for all costs incurred by Landlord to alter the Building (or Landlord's plans for the Building) as a result of Tenant's requested changes.

(c) **Working Drawings**. Landlord shall cause the TI Architect to prepare and deliver to Tenant for review and comment construction plans, specifications and drawings for the Tenant

Improvements ("**TI Construction Drawings**"), which TI Construction Drawings shall be prepared substantially in accordance with the Space Plan. Tenant shall be solely responsible for ensuring that the TI Construction Drawings reflect Tenant's requirements for the Tenant Improvements. Tenant shall deliver its written comments on the TI Construction Drawings to Landlord not later than 10 business days after Tenant's receipt of the same; provided, however, that Tenant may not disapprove any matter that is consistent with the Space Plan without submitting a Change Request. Landlord and the TI Architect shall consider all such comments in good faith and shall, within 10 business days after receipt, notify Tenant how Landlord proposes to respond to such comments, but Tenant's review rights pursuant to the foregoing sentence shall not delay the design or construction schedule for the Tenant Improvements. Any disputes in connection with such comments shall be resolved in accordance with Section 2(d) hereof. Provided that the design reflected in the TI Construction Drawings is consistent with the Space Plan, Tenant shall approve the TI Construction Drawings submitted by Landlord, unless Tenant submits a Change Request. Once approved by Tenant, subject to the provisions of Section 4 below, Landlord shall not materially modify the TI Construction Drawings except as may be reasonably required in connection with the issuance of the TI Permit (as defined in Section 3(b) below). Landlord shall notify Tenant of any such material modifications as may be reasonably required in connection with the issuance of the TI Permit.

(d) **Approval and Completion**. Upon any dispute regarding the design of the Tenant Improvements, which is not settled within 10 business days after notice of such dispute is delivered by one party to the other, Tenant may make the final decision regarding the design of the Tenant Improvements, provided (i) Tenant acts reasonably and such final decision is either consistent with or a compromise between Landlord's and Tenant's positions with respect to such dispute, (ii) that all costs and expenses resulting from any such decision by Tenant shall be payable by Tenant, except to the extent that the design chosen by Tenant is already included within the scope the Space Plan, and (iii) Tenant's decision will not affect the base Building, structural components of the Building or any Building Systems. Any changes to the TI Construction Drawings following Landlord's and Tenant's approval of same requested by Tenant shall be processed as provided in Section 4 hereof.

3. **Performance of Landlord's Work**.

(a) **Definition of Landlord's Work**. As used herein, "**Landlord's Work**" shall mean the work of constructing the Tenant Improvements.

(b) **Commencement and Permitting**. Landlord shall commence construction of the Tenant Improvements upon obtaining a building permit (the "**TI Permit**") authorizing the construction of the Tenant Improvements consistent with the TI Construction Drawings approved by Tenant, The cost of obtaining the TI Permit shall be payable by Landlord. Tenant shall assist Landlord in obtaining the TI Permit. If any Governmental Authority having jurisdiction over the construction of Landlord's Work or any portion thereof shall impose terms or conditions upon the construction thereof that: (i) are inconsistent with Landlord's obligations hereunder, (ii) increase the cost of constructing Landlord's Work, or (iii) will materially delay the construction of Landlord's Work, Landlord and Tenant shall reasonably and in good faith seek means by which to mitigate or eliminate any such adverse terms and conditions

(c) **Completion of Landlord's Work**. Landlord shall substantially complete or cause to be substantially completed Landlord's Work in a good and workmanlike manner, in accordance with the TI Permit subject, in each case, to Minor Variations and normal "punch list" items of a non-material nature that do not interfere with the use of the Expansion Premises and shall obtain a permit card issued by the applicable Governmental Authority or verbal approval from the building inspector permitting occupancy of the Expansion Premises ("**Substantial Completion**" or "**Substantially Complete**"). Upon Substantial Completion of Landlord's Work, Landlord shall require the TI Architect and the general contractor to execute and deliver, for the benefit of Tenant and Landlord, a Certificate of Substantial Completion in the form of the American Institute of Architects ("**AIA**") document G704. For purposes of this Expansion Premises Work Letter, "**Minor Variations**" shall mean any modifications reasonably required: (i) to comply with all applicable Legal Requirements and/or to obtain or to comply with any required permit

(including the TI Permit); (ii) to comply with any request by Tenant for modifications to Landlord's Work; (iii) to comport with good design, engineering, and construction practices that are not material; or (iv) to make reasonable adjustments for field deviations or conditions encountered during the construction of Landlord's Work.

(d) **Selection of Materials**. Where more than one type of material or structure is indicated on the TI Construction Drawings approved by Landlord and Tenant, the option will be selected at Landlord's sole and absolute subjective discretion. As to all building materials and equipment that Landlord is obligated to supply under this Expansion Premises Work Letter, Landlord shall select the manufacturer thereof in its sole and absolute subjective discretion.

(e) **Delivery/Acceptance**. When Landlord's Work is Substantially Complete, subject to the remaining terms and provisions of this Section 3(e), Tenant shall accept Delivery of the Expansion Premises. Tenant's taking possession and acceptance of the Expansion Premises shall not constitute a waiver of: (i) any warranty with respect to workmanship (including installation of equipment) or material (exclusive of equipment provided directly by manufacturers), (ii) any non-compliance of Landlord's Work with applicable Legal Requirements, or (iii) any claim that Landlord's Work was not completed substantially in accordance with the TI Construction Drawings (subject to Minor Variations and such other changes as are permitted hereunder) (collectively, a "**Construction Defect**"). Tenant shall have one year after Substantial Completion within which to notify Landlord of any such Construction Defect discovered by Tenant, and Landlord shall use reasonable efforts to remedy or cause the responsible contractor to remedy any such Construction Defect within 30 days thereafter. Notwithstanding the foregoing, Landlord shall not be in default under the Lease if the applicable contractor, despite Landlord's reasonable efforts, fails to remedy such Construction Defect within such 30-day period, in which case Landlord shall have no further obligation with respect to such Construction Defect other than to cooperate, at no cost to Landlord, with Tenant should Tenant elect to pursue a claim against such contractor.

Tenant shall be entitled to receive the benefit of all construction warranties and manufacturer's equipment warranties relating to equipment installed in the Expansion Premises. If requested by Tenant, Landlord shall attempt to obtain extended warranties from manufacturers and suppliers of such equipment, but the cost of any such extended warranties shall be borne solely by Tenant. Landlord shall promptly undertake and complete, or cause to be completed, all punch list items. Landlord shall endeavor, in connection with Landlord's completion of such punch list items, to minimize interference with Tenant's use of the Expansion Premises for the Permitted Use.

(f) **Expansion Premises Commencement Date Delay**. Except as otherwise provided in the Lease, Delivery of the Expansion Premises shall occur when Landlord's Work has been Substantially Completed in the Expansion Premises, except to the extent that completion of Landlord's Work shall have been actually delayed by any one or more of the following causes ("**Tenant Delay**"):

(i) Tenant's Representative was not available to give or receive any Communication or to take any other action required to be taken by Tenant hereunder;

(ii) Tenant's request for Change Requests (as defined in Section 4(a) below) whether or not any such Change Requests are actually performed;

(iii) Construction of any Change Requests;

(iv) Tenant's request for materials, finishes or installations requiring unusually long lead times, provided that Landlord notifies Tenant of such long lead times prior to any delay in the completion of Landlord's Work;

(v) Tenant's delay in reviewing, revising or approving plans and specifications beyond the periods set forth herein;

(vi) Tenant's delay in providing information critical to the normal progression of the Project. Tenant shall provide such information as soon as reasonably possible, but in no event longer than one week after receipt of any request for such information from Landlord;

(vii) Tenant's delay in making payments to Landlord for Excess TI Costs (as defined in Section 5(b) below); or

(viii) Any other act or omission by Tenant or any Tenant Party (as defined in the Lease), or persons employed by any of such persons.

If Delivery is delayed for any of the foregoing reasons, then Landlord shall cause the TI Architect to certify the date on which the Tenant Improvements would have been Substantially Completed in the Expansion Premises but for such Tenant Delay and such certified date shall be the date of Delivery.

4. **Changes**. Any changes requested by Tenant to the Tenant Improvements after the delivery and approval by Landlord of the Space Plan shall be requested and instituted in accordance with the provisions of this Section 4 and shall be subject to the written approval of Landlord and the TI Architect, such approval not to be unreasonably withheld, conditioned or delayed.

(a) **Tenant's Request For Changes**. If Tenant shall request changes to the Tenant Improvements ("**Changes**"), Tenant shall request such Changes by notifying Landlord in writing in substantially the same form as the AIA standard change order form (a "**Change Request**"), which Change Request shall detail the nature and extent of any such Change. Such Change Request must be signed by Tenant's Representative. Landlord shall, before proceeding with any Change, use commercially reasonable efforts to respond to Tenant as soon as is reasonably possible with an estimate of: (i) the time it will take, and (ii) the architectural and engineering fees and costs that will be incurred, to analyze such Change Request (which costs shall be paid by Tenant to the extent actually incurred, whether or not such change is implemented). Landlord shall thereafter submit to Tenant in writing, within 5 business days of receipt of the Change Request (or such longer period of time as is reasonably required depending on the extent of the Change Request), an analysis of the additional cost or savings involved, including, without limitation, architectural and engineering costs and the period of time, if any, that the Change will extend the date on which Landlord's Work will be Substantially Complete. Any such delay in the completion of Landlord's Work caused by a Change, including any suspension of Landlord's Work while any such Change is being evaluated and/or designed, shall be Tenant Delay.

(b) **Implementation of Changes**. If Tenant: (i) approves in writing the cost or savings and the estimated extension in the time for completion of Landlord's Work, if any, and (ii) deposits with Landlord any Excess TI Costs required in connection with such Change, Landlord shall cause the approved Change to be instituted. Notwithstanding any approval or disapproval by Tenant of any estimate of the delay caused by such proposed Change, the TI Architect's determination of the amount of Tenant Delay in connection with such Change shall be final and binding on Landlord and Tenant.

5. **Costs**.

(a) **TI Costs**. Landlord shall be responsible for the payment of design, permits and construction costs in connection with the construction of the Tenant Improvements, including, without limitation, the cost of preparing the TI Construction Drawings and the Space Plan and Landlord's out-of-pocket expenses (collectively, "**TI Costs**"). Notwithstanding anything to the contrary contained herein, in no event shall Landlord be required to pay for any furniture, personal property or other non-Building system materials or equipment, including, but not limited to, Tenant's voice or data cabling, non-ducted biological safety cabinets and other scientific equipment not incorporated into the Tenant Improvements.

(b) **Excess TI Costs**. Notwithstanding anything to the contrary contained herein, Tenant acknowledges and agrees that Landlord shall have no responsibility for any costs arising from or related

to Tenant's changes to the Space Plan or approved TI Construction Drawings, Tenant Delays, the cost of Changes and Change Request (collectively, "**Excess TI Costs**"). Tenant shall deposit with Landlord, as a condition precedent to Landlord's obligation to complete the Tenant Improvements, 100% of the Excess TI Costs, If Tenant fails to deposit any Excess TI Costs with Landlord, Landlord shall have all of the rights and remedies set forth in the Lease for nonpayment of Rent (including, but not limited to, the right to interest at the Default Rate and the right to assess a late charge). For purposes of any litigation instituted with regard to such amounts, those amounts will be deemed Rent under the Lease.

6. **Tenant Access**.

(a) **Tenant's Access Rights**. Landlord hereby agrees to permit Tenant access, at Tenant's sole risk and expense, to the Expansion Premises (i) 30 days prior to the Expansion Premises Commencement Date provided such access is coordinated with the TI Architect and the general contractor, and complies with the Lease and all other reasonable restrictions and conditions Landlord may impose, and (ii) prior to the completion of Landlord's Work, to inspect and observe work in process; all such access shall be during normal business hours or at such other times as are reasonably designated by Landlord. Any entry by Tenant shall comply with all established safety practices of Landlord's contractor and Landlord until completion of Landlord's Work and acceptance thereof by Tenant.

(b) **No Interference**. Neither Tenant nor any Tenant Party (as defined in the Lease) shall interfere with the performance of Landlord's Work, nor with any inspections or issuance of final approvals by applicable Governmental Authorities, and upon any such interference, Landlord shall have the right to exclude Tenant and any Tenant Party from the Expansion Premises until Substantial Completion of Landlord's Work.

(c) **No Acceptance of Expansion Premises**. The fact that Tenant may, with Landlord's consent, enter into the Expansion Premises prior to the date Landlord's Work is Substantially Complete shall not in and of itself be deemed an acceptance by Tenant of possession of the Expansion Premises, but in such event Tenant shall defend with counsel reasonably acceptable by Landlord, indemnify and hold Landlord harmless from and against any loss of or damage to Tenant's property, completed work, fixtures, equipment, materials or merchandise, and from liability for death of, or injury to, any person, caused by the act or omission of Tenant or any Tenant Party.

7. **Miscellaneous**.

(a) **Consents**. Whenever consent or approval of either party is required under this Expansion Premises Work Letter, that party shall not unreasonably withhold, condition or delay such consent or approval, unless expressly set forth herein to the contrary.

(b) **Modification**. No modification, waiver or amendment of this Expansion Premises Work Letter or of any of its conditions or provisions shall be binding upon Landlord or Tenant unless in writing signed by Landlord and Tenant.

Schedule 1

Space Plan

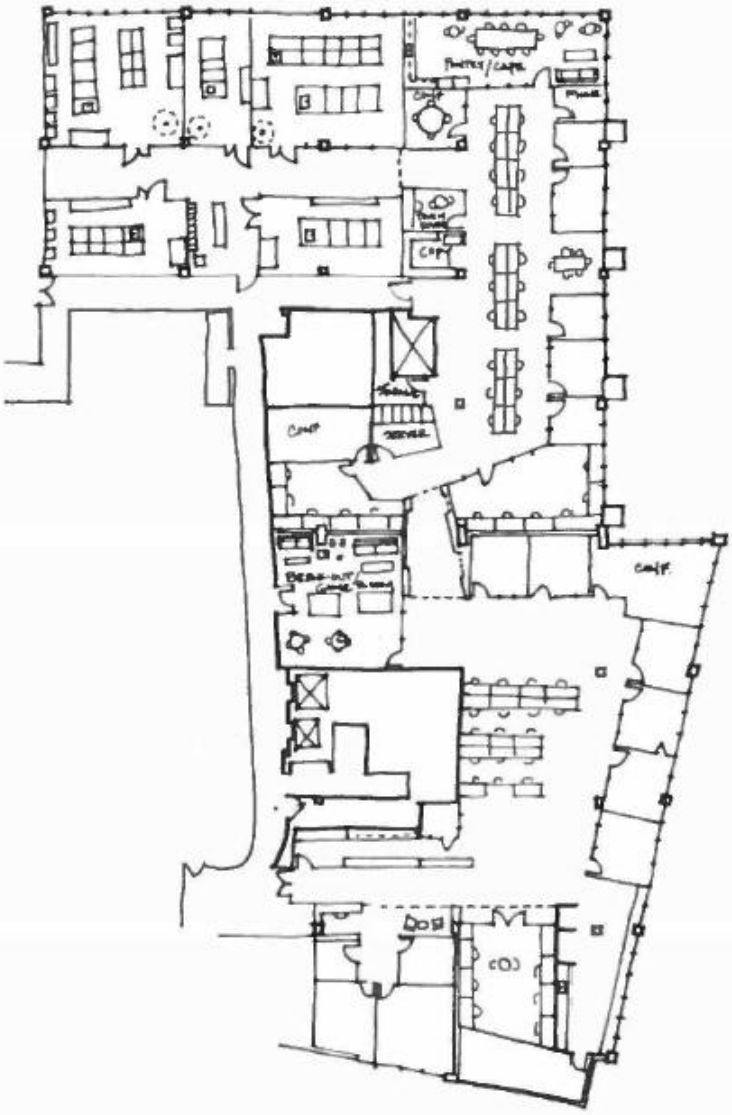


Exhibit C

Asbestos Disclosure

NOTIFICATION OF THE PRESENCE OF ASBESTOS CONTAINING MATERIALS

This notification provides certain information about asbestos within or about the Premises at 1551 Eastlake Avenue, Seattle, WA ("**Building**") and in accordance with Washington Administrative Code, Chapter 296-62-07721.

Historically, asbestos was commonly used in building products used in the construction of buildings across the country. Asbestos-containing building products were used because they are fire-resistant and provide good noise and temperature insulation. Because of their prevalence, asbestos-containing materials, or ACMs, are still sometimes found in buildings today.

An asbestos survey of the Building has determined that ACMs and/or materials that might contain ACMs, referred to as presumed asbestos-containing materials or PACMs, are present within or about the Premises as follows:

Material Description	Material Location
Floor Mastic (not covered by floor tile)	Various locations within the parking garage
Flooring Material and Mastic beneath new floor tile (PACM)	Landings of stairwells #1 and #2

Because ACMs and PACMs are present and may continue to be present within or about the Building, we have hired an independent environmental consulting firm to prepare an operations and maintenance program ("**O&M Program**"). The O&M Program is designed to minimize the potential of any harmful asbestos exposure to any person within or about the Building. The O&M Program includes a description of work methods to be taken in order to maintain any ACMs or PACMs within or about the Building in good condition and to prevent any significant disturbance of such ACMs or PACMs. Appropriate personnel receive regular periodic training on how to properly administer the O&M Program.

The O&M Program describes the risks associated with asbestos exposure and how to prevent such exposure through appropriate work practices. ACMs and PACMs generally are not thought to be a threat to human health unless asbestos fibers are released into the air and inhaled. This does not typically occur unless (1) the ACMs are in a deteriorating condition, or (2) the ACMs have been significantly disturbed (such as through abrasive cleaning, or maintenance or renovation activities). If inhaled, asbestos fibers can accumulate in the lungs and, as exposure increases, the risk of disease (such as asbestosis or cancer) increases. However, measures to minimize exposure, and consequently minimize the accumulation of asbestos fibers, reduce the risks of adverse health effects.

The O&M Program describes a number of activities that should be avoided in order to prevent a release of asbestos fibers. In particular, you should be aware that some of the activities which may present a health risk include moving, drilling, boring, or otherwise disturbing ACMs. Consequently, such activities should not be attempted by any person not qualified to handle ACMs.

The O&M Program is available for review during regular business hours at our office located at 1600 Fairview Avenue East, Suite 100, Seattle WA 98102.

THIRD AMENDMENT TO LEASE

THIS THIRD AMENDMENT TO LEASE (this "**Third Amendment**") is made as of November 5, 2015, by and between **ARE-SEATTLE NO. 11, LLC**, a Delaware limited liability company ("**Landlord**"), and **ADAPTIVE BIOTECHNOLOGIES CORPORATION**, a Washington corporation ("**Tenant**").

RECITALS

A. Landlord and Tenant are now parties to that certain Lease Agreement dated as of July 21, 2011 ("**Original Lease**"), as amended by that certain First Amendment to Lease dated as of August 26, 2011, and as further amended by that certain Amended and Restated Second Amendment to Lease dated as of June 30, 2014 (as amended, the "**Lease**"). Pursuant to the Lease, Tenant leases certain premises (the "**Existing Premises**") located on the second floor consisting of approximately 20,324 rentable square feet in that certain building located at 1551 Eastlake Avenue, Seattle, Washington. The Existing Premises are more particularly described in the Lease. Capitalized terms used herein without definition shall have the meanings defined for such terms in the Lease.

B. Landlord and Tenant desire, subject to the terms and conditions set forth below, to amend the Lease to, provide for the temporary use by Tenant of that certain portion of the third floor of the Building, consisting of approximately 9,594 rentable square feet, as shown on **Exhibit A** attached to this Third Amendment ("**Third Floor Space**").

NOW, THEREFORE, in consideration of the foregoing Recitals, which are incorporated herein by this reference, the mutual promises and conditions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Landlord and Tenant hereby agree as follows:

1. **Temporary Expansion Premises**. Commencing on the date that is 1 business day after the mutual execution and delivery of this Third Amendment by the parties ("**Third Floor Space Commencement Date**"), and continuing until the date that is 6 months after the Third Floor Space Commencement Date ("**Third Floor Space Term**"), Landlord shall lease to Tenant and Tenant shall lease from Landlord the Third Floor Space. Tenant acknowledges and agrees that all of the terms and conditions of the Lease shall apply to the leasing of the Third Floor Space, except that (a) the term of the lease with respect to the Third Floor Space shall be as set forth in the first sentence of this Section 1; (b) Tenant shall not be required to pay Base Rent with respect to the Third Floor Space during the Third Floor Space Term; (c) Tenant shall commence paying Tenant's Share of Operating Expenses with respect to the Third Floor Space (which is equal to 8.29%) on the Third Floor Space

Commencement Date and Tenant shall continue to pay Tenant's Share of Operating Expenses with respect to the Third Floor Space thereafter on the first day of each month during the Third Floor Space Term; (d) Landlord shall not be required to make any improvements to the Third Floor Space or provide any tenant improvement allowance with respect to the Third Floor Space and Tenant shall accept the Second Floor in its 'as is" condition; (e) Tenant shall not be required to deliver any additional Security Deposit with respect to the Third Floor Space; (f) notwithstanding anything to the contrary contained in Section 22 of the original Lease, Tenant shall not have the right to sublease any portion of the Third Floor Space or assign the Lease with respect to the Third Floor Space; (g) Tenant may not make any Alterations or any other improvements in the Third Floor Space without the prior written approval of Landlord, which approval may be granted or withheld in Landlord's sole and absolute discretion; and (h) any existing Extension Rights relating to the Existing Premises shall not apply to the Third Floor Space.

Tenant shall surrender the Third Floor Space upon the expiration of the Third Floor Space Term in accordance with the surrender requirements contained in the Lease. Following the expiration or earlier termination of the Third Floor Space Term, Tenant shall have no further rights of any kind with respect to the Third Floor Space. Nothing contained herein shall release Tenant from any obligations under the Lease with respect to the Third Floor Space which survive the expiration or earlier termination of the Lease.

2. **Asbestos**.

a. **Notification of Asbestos**. Landlord hereby notifies Tenant of the presence of asbestos-containing materials ("**ACMs**") and/or presumed asbestos-containing materials ("**PACMs**") within or about the Premises in the location identified in **Exhibit B** attached to this First Amendment.

b. **Tenant Acknowledgement**. Tenant hereby acknowledges receipt of the notification in paragraph (a) of this Section 2 and understands that the purpose of such notification is to make Tenant and any agents, employees, and contractors of Tenant, aware of the presence of ACMs and/or PACMs within or about the Building in order to avoid or minimize any damage to or disturbance of such AGMs and/or PACMs.

CMR
Tenant's Initials

c. **Acknowledgement from Contractors/Employees**. Tenant shall give Landlord at least 14 days' prior written notice before conducting, authorizing or permitting any of the activities listed below within or about the Premises, and before soliciting bids from any person to perform such services. Such notice shall identify or describe the proposed scope, location, date and time of such activities and the name, address and telephone number of each person who may be conducting such activities. Thereafter, Tenant shall grant Landlord reasonable access to the Premises to determine whether any ACMs or PACMs will be disturbed in connection with such activities. Tenant shall not solicit bids from any person for the performance of such activities without Landlord's prior written approval. Upon Landlord's request, Tenant shall deliver to Landlord a copy of a signed acknowledgement from any contractor, agent, or employee of Tenant acknowledging receipt of information describing the presence of ACMs and/or PACMs within or about the Premises in the locations identified in **Exhibit B** prior to the commencement of such activities. Nothing in this Section 2 shall be deemed to expand Tenant's rights under the Lease or otherwise to conduct, authorize or permit any such activities.

(i) Removal of thermal system insulation ("**TSI**") and surfacing ACMs arid PACMs (i.e., sprayed-on or troweled-on material, e.g., textured ceiling paint or fireproofing material);

(ii) Removal of ACMs or PACMs that are not TSI or surfacing ACMs or PACMs; or

(iii) Repair and maintenance of operations that are likely to disturb ACMs or PACMs.

3. **OFAC**. Tenant and all beneficial owners of Tenant are currently (a) in compliance with and shall at all times during the Term of the Lease remain in compliance with the regulations of the Office of Foreign Assets Control ("**OFAC**") of the U.S. Department of Treasury and any statute, executive order, or regulation relating thereto (collectively, the "**OFAC Rules**"), (b) not listed on, and shall not during the term of the Lease be listed on, the Specially Designated Nationals and Blocked Persons List, Foreign Sanctions Evaders List or the Sectoral Sanctions Identifications List, which are all maintained by OFAC and/or on any other similar list maintained by OFAC or other governmental authority pursuant to any authorizing statute, executive order, or regulation, and (c) not a person or entity with whom a U.S. person is prohibited from conducting business under the OFAC Rules.

4. **Miscellaneous**.

a. This Third Amendment is the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior and contemporaneous oral and written agreements and discussions. This Third Amendment may be amended only by an agreement in writing, signed by the parties hereto.

b. This Third Amendment is binding upon and shall inure to the benefit of the parties hereto, and their respective successors and assigns.

c. This Third Amendment may be executed in any number of counterparts, each of which shall be deemed an original, but all of which when taken together shall constitute one and the same instrument. The signature page of any counterpart may be detached therefrom without impairing the legal effect of the signature(s) thereon provided such signature page is attached to any other counterpart identical thereto except having additional signature pages executed by other parties to this Third Amendment attached thereto.

d. Except as amended and/or modified by this Third Amendment, the Lease is hereby ratified and confirmed and all other terms of the Lease shall remain in full force and effect, unaltered and unchanged by this Third Amendment. In the event of any conflict between the provisions of this Third Amendment and the provisions of the Lease, the provisions of this Third Amendment shall prevail. Whether or not specifically amended by this Third Amendment, all of the terms and provisions of the Lease are hereby amended to the extent necessary to give effect to the purpose and intent of this Third Amendment.

[Signatures are on the next page.]

IN WITNESS WHEREOF, the parties hereto have executed this Third Amendment as of the day and year first above written.

TENANT:

ADAPTIVE BIOTECHNOLOGIES CORPORATION,
a Washington corporation

By: /s/ Chad Robins
Its: CEO and President

LANDLORD:

ARE-SEATTLE NO. 11, LLC,
a Delaware limited liability company

By: ALEXANDRIA REAL ESTATE EQUITIES, L.P., a Delaware limited partnership, managing member

By: ARE-QRS CORP.,
a Maryland corporation,
general partner

By: /s/ Jackie Clem
Its: Senior Vice President RE Legal Affairs

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Los Angeles)

On November 9, 2015 before me, Charles L. Murphy, Notary Public
(insert name and title of the officer)

personally appeared Jackie Clem, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature /s/ Charles L. Murphy **(Seal)**

TENANT'S ACKNOWLEDGMENT

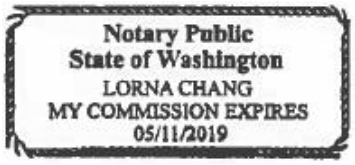
STATE OF WA

COUNTY OF KING | ss.

On this 5 day of NOVEMBER, 2015, before me personally appeared Chad Robins, to me known to be the CEO of Adaptive Biotechnologies, a , that executed the within and foregoing instrument, and Acknowledged the said instrument to be the free and voluntary act and deed of said corporation for the uses and purposes therein mentioned, and on oath stated that they were authorized to execute said instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

/s/ Lorna Chang
(Signature of Notary)



Lorna Chang
(Legiby Print or Stamp Name of Notary)
Notary public in and for the State of Washington, residing at Seattle, WA
My appointment expires 5.11.19

EXHIBIT A

Third Floor Space

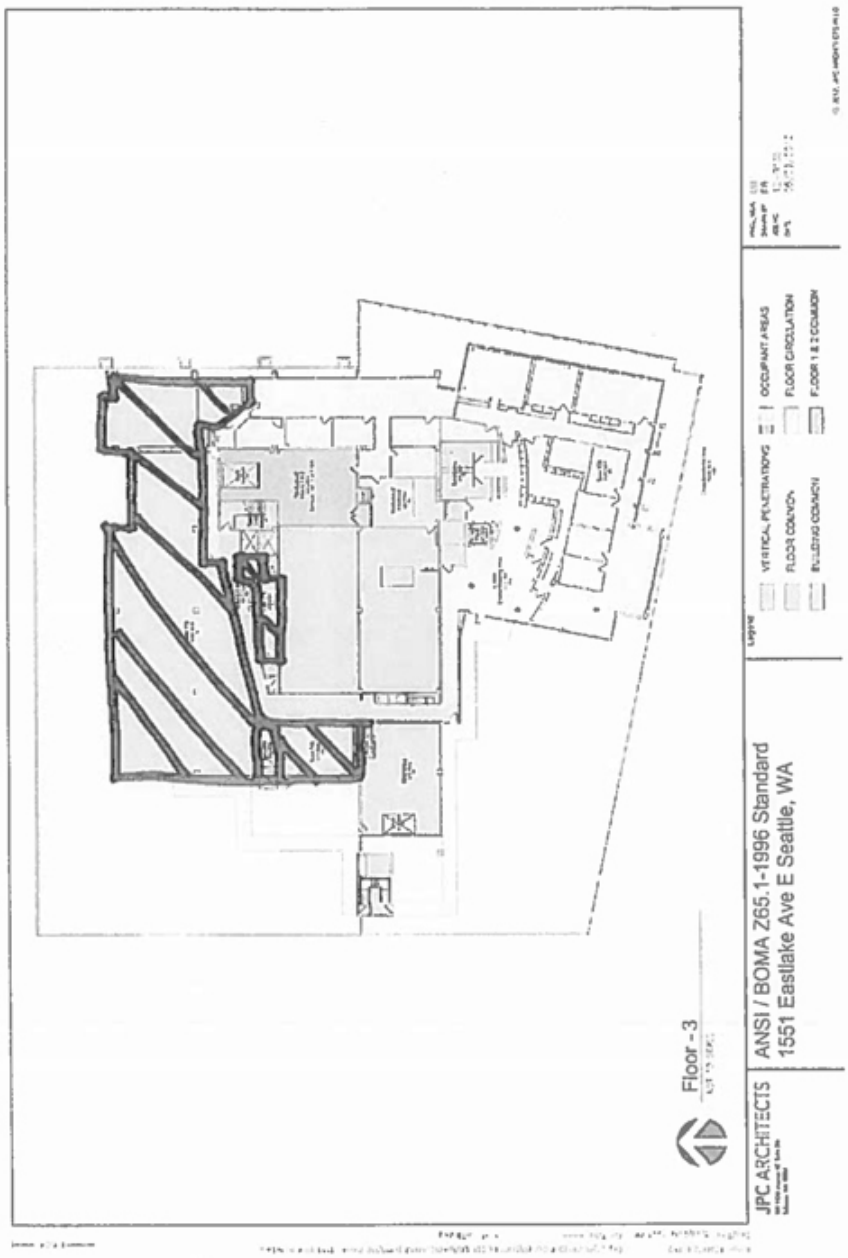


EXHIBIT B

Asbestos Disclosure

NOTIFICATION OF THE PRESENCE OF ASBESTOS CONTAINING MATERIALS

This notification provides certain information about asbestos within or about the Premises at 1551 Eastlake Avenue, Seattle, WA ("Building") and in accordance with Washington Administrative Code, Chapter 296-62-07721.

Historically, asbestos was commonly used in building products used in the construction of buildings across the country. Asbestos-containing building products were used because they are fire-resistant and provide good noise and temperature insulation. Because of their prevalence, asbestos-containing materials, or AGMs, are still sometimes found in buildings today.

An asbestos survey of the Building has determined that ACMs and/or materials that might contain ACMs, referred to as presumed asbestos-containing materials or PACMs, are present within or about the Premises as follows:

Material Description	Material Location
Floor Mastic (not covered by floor tile)	Various locations within the parking garage
Flooring Material and Mastic beneath new floor tile (PACM)	Landings of stairwells #1 and #2

Because ACMs and PACMs are present and may continue to be present within or about the Building, we have hired an independent environmental consulting firm to prepare an operations and maintenance program ("**O&M Program**"). The O&M Program is designed to minimize the potential of any harmful asbestos exposure to any person within or about the Building. The O&M Program includes a description of work methods to be taken in order to maintain any ACMs or PACMs within or about the Building in good condition and to prevent any significant disturbance of such ACMs or PACMs. Appropriate personnel receive regular periodic training on how to properly administer the O&M Program.

The O&M Program describes the risks associated with asbestos exposure and how to prevent such exposure through appropriate work practices. ACMs and PACMs generally are not thought to be a threat to human health unless asbestos fibers are released into the air and inhaled. This does not typically occur unless (1) the ACMs are in a deteriorating condition, or (2) the ACMs have been significantly disturbed (such as through abrasive cleaning, or maintenance or renovation activities). If inhaled, asbestos fibers can accumulate in the lungs and, as exposure increases, the risk of disease (such as asbestosis or cancer) increases. However, measures to minimize exposure, and consequently minimize the accumulation of asbestos fibers, reduce the risks of adverse health effects.

The O&M Program describes a number of activities that should be avoided in order to prevent a release of asbestos fibers. In particular, you should be aware that some of the activities which may present a health risk include moving, drilling, boring, or otherwise disturbing ACMs. Consequently, such activities should not be attempted by any person not qualified to handle ACMs.

The O&M Program is available for review during regular business hours at our office located at 1600 Fairview Avenue East, Suite 100, Seattle WA 98102.

FOURTH AMENDMENT TO LEASE

THIS FORTH AMENDMENT TO LEASE (this "**Forth Amendment**") is made as of December 23, 2015, by and between **ARE-SEATTLE NO. 11, LLC**, a Delaware limited liability company ("**Landlord**"), and **ADAPTIVE BIOTECHNOLOGIES CORPORATION**, a Washington corporation ("**Tenant**").

RECITALS

A. Landlord and Tenant are now parties to that certain Lease Agreement dated as of July 21, 2011, as amended by that certain First Amendment to Lease dated as of August 26, 2011, as further amended by that certain Amended and Restated Second Amendment to Lease dated as of June 30, 2014 (the "**Second Amendment**"), and as further amended by that certain Third Amendment to Lease dated as of November 5, 2015 (as amended, the "**Lease**"). Pursuant to the Lease, Tenant leases certain premises consisting of approximately 20,324 rentable square feet ("**Existing Premises**") on the second floor of that certain building located at 1551 Eastlake Avenue, Seattle, Washington. The Existing Premises are more particularly described in the Lease. Capitalized terms used herein without definition shall have the meanings defined for such terms in the Lease.

B. Landlord and Tenant desire, subject to the terms and conditions set forth below, to amend the Lease to, among other things, (i) expand the size of the Existing Premises by adding those portions of the second and third floors of the Building consisting of approximately 28,100 rentable square feet, as shown on **Exhibit A** attached to this Fourth Amendment ("**Second Expansion Premises**"), (ii) extend the Base Term of the Lease, and (iii) provide Tenant with an option to expand the Premises to include approximately 8,594 rentable square feet on the third floor of the Building, as shown on **Exhibit D** attached hereto (the "**Third Floor Option Space**").

NOW, THEREFORE, in consideration of the foregoing Recitals, which are incorporated herein by this reference, the mutual promises and conditions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Landlord and Tenant hereby agree as follows:

1. **Second Expansion Premises**. In addition to the Existing Premises, commencing on the Second Expansion Premises Commencement Date (as defined below), Landlord leases to Tenant, and Tenant leases from Landlord, the Second Expansion Premises.

2. **Delivery**. Landlord shall use reasonable efforts to deliver possession of the Second Expansion Premises to Tenant ("**Delivery**" or "**Deliver**") for the performance by Tenant of Tenant Improvements in the Second Expansion Premises on or before the Target Second Expansion Premises Commencement Date. The "**Target Second Expansion Premises Commencement Date**" shall be December 1, 2015. If Landlord fails to timely Deliver the Second Expansion Premises, Landlord shall not be liable to Tenant for any loss or damage resulting therefrom, and the Lease with respect to the Second Expansion Premises shall not be void or voidable. As used herein, the term "**Tenant Improvements**" shall have the meaning set forth for such term in the Fourth Amendment Work Letter attached to this Fourth Amendment as **Exhibit B.**

The "**Second Expansion Premises Commencement Date**" shall be the date Landlord Delivers the Second Expansion Premises to Tenant in broom clean condition. The "**Second Expansion Premises Rent Commencement Date**" shall be June 1, 2016. Upon the request of Landlord, Tenant shall execute and deliver a written acknowledgment of the Second Expansion Premises Commencement Date, the Second Expansion Premises Rent Commencement Date and the expiration date of the Lease in substantially the form of the "Acknowledgement of Commencement Date" attached to the Lease as **Exhibit D;** provided, however, Tenant's failure to execute and deliver such acknowledgment shall not affect either party's rights hereunder.

The portion of the Second Expansion Premises located on the third floor, as shown on **Exhibit A** attached to this Fourth Amendment, may be used as a gym for the exclusive use of Tenant's employees (the "**Gym Area**"). If elected by Tenant by written notice to Landlord delivered within 12 months after the date of this Fourth Amendment, Landlord shall perform the work and provide the gym equipment, at Landlord's expense, described on **Exhibit E** attached hereto in the Gym Area (collectively, the "**Gym Work**"). Tenant acknowledges that Landlord shall require access to the Gym Area following the Second Expansion Premises Commencement Date in order to complete the Gym Work. Landlord and its contractors and agents shall have the right to enter the Gym Area following the Second Expansion Premises Commencement Date in order to perform the Gym Work. Tenant acknowledges that Landlord's completion of the Gym Work may adversely affect Tenant's use and occupancy of the Premises. Tenant waives all claims against Landlord for rent abatement in connection with the Gym Work.

Except as set forth in the Fourth Amendment Work Letter: (i) Tenant shall accept the Second Expansion Premises in their condition as of the Second Expansion Premises Commencement Date, subject to all applicable Legal Requirements; (ii) Landlord shall have no obligation for any defects in the Second Expansion Premises; and (iii) Tenant's taking possession of the Second Expansion Premises shall be conclusive evidence that Tenant accepts the Second Expansion Premises and that the Second Expansion Premises were in good condition at the time possession was taken.

Tenant agrees and acknowledges that, except as otherwise expressly set forth in this Fourth Amendment or in the Lease, neither Landlord nor any agent of Landlord has made any representation or warranty with respect to the condition of all or any portion of the Second Expansion Premises, and/or the suitability of the Second Expansion Premises for the conduct of Tenant's business, and Tenant waives any implied warranty that the Second Expansion Premises are suitable for the Permitted Use.

3. **Premises and Rentable Area of Premises**. Commencing on the Second Expansion Premises Commencement Date, the defined terms "**Premises**," "**Rentable Area of Premises**" and "**Rentable Area of Project**" on page 1 of the Lease shall be deleted in their entirety and replaced with the following:

> **"Premises:** That portion of the Building containing approximately 48,424 rentable square feet, consisting of (i) that certain portion of the second floor containing approximately 7,724 rentable square feet (the "**Original Premises**"), (ii) that certain portion of the second floor containing approximately 12,600 rentable square feet (the "**Expansion Premises**"), and (iii) those certain portions of the second and third floors containing approximately 28,100 rentable square feet (the "**Second Expansion Premises**"), all as shown on **Exhibit A**."
>
> **"Rentable Area of Premises:** 48,424 sq. ft."
>
> **"Rentable Area of Project:** 117,482 sq. ft "

As of the Second Expansion Premises Commencement Date, **Exhibit A** to the Lease shall be amended to include the Second Expansion Premises as shown on **Exhibit A** attached to this Fourth Amendment.

4. **Base Term** Commencing on the Second Expansion Premises Commencement Date, the defined term "**Base Term**" on page 1 of the Lease is deleted in its entirety and replaced with the following:

> **"Base Term:** Commencing (i) with respect to the Original Premises on the Commencement Date, (ii) with respect to the Expansion Premises on the Expansion Premises Commencement Date, and (iii) with respect to the Second Expansion Premises on the Second Expansion Premises Commencement Date, and ending with respect to the entire Premises on the date that is 84 months from the first day of the first full month after the Second Expansion Premises Rent Commencement Date."

5. **Base Rent.**

a. Original Premises. Tenant shall continue to pay Base Rent for the Original Premises as provided for in the Lease through June 30, 2020. Thereafter, Base Rent payable for the Original Premises shall continue to increase on each Adjustment Date (as defined in Section 4 of the Lease) pursuant to the terms of Section 4 of the Lease.

b. Expansion Premises. Tenant shall continue to pay Base Rent for the Expansion Premises as provided for in the Lease through June 30, 2020. Thereafter, Base Rent payable for the Expansion Premises shall continue to increase on each Expansion Premises Adjustment Date (as defined in Section 5(b) of the Second Amendment) pursuant to the terms of Section 5(b) of the Second Amendment.

c. Second Expansion Premises. Commencing on the Second Expansion Premises Rent Commencement Date (i.e., June 1, 2016), Tenant shall pay Base Rent for the Second Expansion Premises at the rate of $45.60 per rentable square foot of the Second Expansion Premises per year. Base Rent payable for the Second Expansion Premises shall be increased on each annual anniversary of the Second Expansion Premises Commencement Date (each, a "**Second Expansion Premises Adjustment Date**"), by multiplying the Base Rent payable for the Second Expansion Premises immediately before the Second Expansion Premises Adjustment Date by 2.5% and adding the resulting amount to the Base Rent payable for the Second Expansion Premises immediately before the Second Expansion Premises Adjustment Date.

d. Additional TI Allowance. In addition to the Tenant Improvement Allowance (as defined in the Fourth Amendment Work Letter), Landlord shall, subject to the terms of the Fourth Amendment Work Letter, make available to Tenant the Additional Tenant Improvement Allowance (as defined in the Fourth Amendment Work Letter). To the extent that Tenant elects to use all or any portion of the Additional Tenant Improvement Allowance and such amount elected by Tenant is actually funded by Landlord, then commencing on the Second Expansion Premises Rent Commencement Date and continuing thereafter on the first day of each month during the Base Term, Base Rent shall be increased by $0.19 per year for each $1.00 of the Additional Tenant Improvement Allowance actually funded by Landlord, as adjusted as additional disbursements of the Additional Tenant Improvement Allowance occur. For example, if $100,000 of the Additional Tenant Improvement Allowance is funded, Base Rent shall be increased by $19,000 per year ($100,000 x $0.19).

6. **Tenant's Share**. Commencing on the Second Expansion Premises Commencement Date, the defined term "**Tenant's Share of Operating Expenses**" on page **1** of the Lease shall be deleted in its entirety and replaced with the following:

> **"Tenant's Share of Operating Expenses:** 41.22%"

7. **Parking**. Subject to all matters of record, Force Majeure, a Taking and the exercise by Landlord of its rights hereunder, Landlord shall make available to Tenant and Tenant shall, in addition to the parking spaces that Tenant has the right to use pursuant to Section 10 of the original Lease and the Expansion Premises Parking Spaces which Tenant has the right to use pursuant to Section 2 of the Second Amendment, be entitled to use, at no additional cost during the Base Term, subject to the terms of Section 10 of the original Lease, Tenant's pro rata share of parking

spaces with respect to the Second Expansion Premises. As of the Second Expansion Premises Commencement Date, Tenant's pro rata share of parking spaces with respect to the Second Expansion Premises shall be equal to 2 parking spaces per 1,000 rentable square feet of the Second Expansion Premises (which is equal to 56 parking spaces (in addition to the parking spaces that Tenant has the right to use pursuant to Section 10 of the original Lease))("**Second Expansion Premises Parking Spaces**"). The Second Expansion Premises Parking Spaces shall be allocated among the Underground Parking, Surface Parking, Northeast Parking and Offsite Parking as follows: 6 unreserved parking spaces in the Underground Parking, 4 unreserved stalls in the Surface Parking, 0 stalls in the Northeast Parking and 46 unreserved stalls in the Offsite Parking. Notwithstanding anything to the contrary contained in the Lease, Landlord shall designate 8 parking spaces in the Surface Parking in an area outside the Building lobby, as reasonably determined by Landlord, as "guest parking" for guests of tenants of the Building. In addition, Tenant shall be entitled, subject to the terms of Section 10 of the original Lease, to 4 additional parking spaces in areas of the Surface Parking designated by Landlord ("**Additional Parking Spaces**"), which 4 Additional Parking Spaces shall be designated as "guest parking" for guests of Tenant and shall be subject to the payment by Tenant of the market rate for each Additional Parking Space, as reasonably determined by Landlord from time to time, which as of the date of this Fourth Amendment shall be $150 per month for each Additional Parking Space plus applicable taxes

8. **Signs**. As of the Second Expansion Premises Commencement Date, Section 38 of the Lease is hereby amended to include the following language:

"Subject to the signage rights of any tenants of the Project existing as of the date of the Fourth Amendment, Tenant shall have the non-exclusive right to display, at Tenant's cost and expense, up to two (2) signs bearing Tenant's name and/or logo ("**Building Signs**") at locations on the Building reasonably acceptable to Landlord and Tenant. Notwithstanding the foregoing, Tenant acknowledges and agrees that the Building Signs including, without limitation, the size, color and type, shall be subject to Landlord's prior written approval, which shall not be unreasonably withheld, shall be consistent with Landlord's signage program at the Project and shall be subject to any and all other required approvals and applicable Legal Requirements. Tenant shall be responsible, at Tenant's sole cost and expense, for the maintenance of the Building Signs, for the removal of the Building Signs at the expiration or earlier termination of this Lease and for the repair of all damage resulting from such removal.

Tenant shall have the right, at Tenant's sole cost and expense, to display signage bearing Tenant's name and logo in a location within the main Building lobby reasonably acceptable to Landlord and Tenant where such signage will be visible through the glass entry doors of the main Building lobby, provided that such signage, including, without limitation, the size, color and type, shall be subject to Landlord's reasonable approval and applicable Legal Requirements."

Notwithstanding anything contained in the Lease or the Fourth Amendment Work Letter, Tenant may apply a portion of the TI Allowance to the cost of installing the Building Signs and other signage to which Tenant is entitled pursuant to this Section 8.

9. **Extension Right**. As of the Second Expansion Premises Commencement Date, Section 40 of the Lease is hereby deleted in its entirety and replaced with the following:

"40. **Right to Extend Term**. Tenant shall have the right to extend the Term of the Lease with respect to the entire Premises only upon the following terms and conditions:

(a) **Extension Rights**. Tenant shall have 2 rights (each, an "**Extension Right**") to extend the term of this Lease for 7 years each (each, an "**Extension Term**") on the same terms and conditions as this Lease (other than with respect to Base Rent and any work letters) by giving Landlord written notice of its election to exercise the Extension Right at least 12 months and not more than 15 months prior to the expiration of the Base Term of the Lease or the expiration of the prior Extension Term, as applicable.

Upon the commencement of an Extension Term, Base Rent shall be payable at the Market Rate (as defined below). Base Rent shall thereafter be adjusted on each annual anniversary of the commencement of such Extension Term by the Rent Adjustment Percentage. As used herein, "**Market Rate**" shall mean the rate that comparable landlords of comparable buildings have accepted in current transactions from non-equity (i.e., not being offered equity in the buildings) and nonaffiliated tenants of similar financial strength for space of comparable size, quality (including all Tenant Improvements, Alterations and other improvements) and floor height in comparable laboratory/office buildings in the South Lake Union area of Seattle, with the determination of the Market Rate to take into account all relevant factors, including term, use, tenant inducements, views, parking costs, leasing commissions, allowances or concessions, if any. Notwithstanding the foregoing, the Market Rate shall in no event be less than the Base Rent payable as of the date immediately preceding the commencement of such Extension Term increased by the Rent Adjustment Percentage multiplied by such Base Rent. In addition, Landlord may impose a market rent for the parking rights provided hereunder.

If, on or before the date which is 270 days prior to the expiration of the Base Term of this Lease or the expiration of the prior Extension Term, as applicable, Tenant has not agreed with Landlord's determination of the Market Rate during the applicable Extension Term after negotiating in good faith, Tenant shall be deemed to have elected arbitration as described in Section 40(b). Tenant acknowledges and agrees that, if Tenant has elected to exercise an Extension Right by delivering notice to Landlord as required in this Section 40(a), Tenant shall have no right thereafter to rescind or elect not to extend the term of the Lease for such Extension Term.

(b) **Arbitration**.

(i) Within 10 days of Tenant's notice to Landlord of its election (or deemed election) to arbitrate Market Rate, each party shall deliver to the other a proposal containing the Market Rate that the submitting party believes to be correct ("**Extension Proposal**"). If either party fails to timely submit an Extension Proposal, the other party's submitted proposal shall determine the Base Rent for the first year of the Extension Term. If both parties submit Extension Proposals, then Landlord and Tenant shall meet within 7 days after delivery of the last Extension Proposal and make a good faith attempt to mutually appoint a single Arbitrator (and defined below) to determine the Market Rate. If Landlord and Tenant are unable to agree upon a single Arbitrator, then each shall, by written notice delivered to the other within 10 days after the meeting, select an Arbitrator. If either party fails to timely give notice of its selection for an Arbitrator, the other party's submitted proposal shall determine the Base Rent for the first year of the Extension Term. The 2 Arbitrators so appointed shall, within 5 business days after their appointment, appoint a third Arbitrator. If the 2 Arbitrators so selected cannot agree on the selection of the third Arbitrator within the time above specified, then either party, on behalf of both parties, may request such appointment of such third Arbitrator by application to any state court of general jurisdiction in the jurisdiction in which the Premises are located, upon 10 days prior written notice to the other party of such intent.

(ii) The decision of the Arbitrator(s) shall be made within 30 days after the appointment of a single Arbitrator or the third Arbitrator, as applicable. The decision of the single Arbitrator shall be final and binding upon the parties. The average of the two closest Arbitrators in a three Arbitrator panel shall be final and binding upon the parties. Each party shall pay the fees and expenses of the Arbitrator appointed by or on behalf of such party and the fees and expenses of the third Arbitrator shall be borne equally by both parties. If the Market Rate for the

first year of the Extension Term is not determined by the first day of the Extension Term, then Tenant shall pay Landlord Base Rent in an amount equal to the Base Rent in effect immediately prior to the Extension Term and increased by the Rent Adjustment Percentage until such determination is made. After the determination of the Market Rate, the parties shall make any necessary adjustments to such payments made by Tenant. Landlord and Tenant shall then execute an amendment recognizing the Market Rate for the Extension Term.

(iii) An "**Arbitrator**" shall be any person appointed by or on behalf of either party or appointed pursuant to the provisions hereof and: (i) shall be (A) a member of the American Institute of Real Estate Appraisers with not less than 10 years of experience in the appraisal of improved office and high tech industrial real estate in the greater Seattle metropolitan area, or (B) a licensed commercial real estate broker with not less than 15 years experience representing landlords and/or tenants in the leasing of high tech or life sciences space in the greater Seattle metropolitan area, (ii) devoting substantially all of their time to professional appraisal or brokerage work, as applicable, at the time of appointment and (iii) be in all respects impartial and disinterested.

(c) **Rights Personal**. The Extension Rights are personal to Tenant and are not assignable without Landlord's consent, which may be granted or withheld in Landlord's sole discretion separate and apart from any consent by Landlord to an assignment of Tenant's interest in the Lease, except that they may be assigned in connection with any Permitted Assignment of this Lease.

(d) **Exceptions**. Notwithstanding anything set forth above to the contrary, the Extension Rights shall, at Landlord's option, not be in effect and Tenant may not exercise either of the Extension Rights:

(i) during any period of time that Tenant is in Default under any provision of this Lease; or

(ii) if Tenant has been in Default under any provision of this Lease 3 or more times, whether or not the Defaults are cured, during the 12 month period immediately prior to the date that Tenant intends to exercise an Extension Right, whether or not the Defaults are cured.

(e) **No Extensions**. The period of time within which any Extension Right may be exercised shall not be extended or enlarged by reason of Tenant's inability to exercise the Extension Rights.

(f) **Termination**. The Extension Rights, at Landlord's option, shall terminate and be of no further force or effect even after Tenant's due and timely exercise of an Extension Right, if, after such exercise, but prior to the commencement date of an Extension Term, (i) Tenant fails to timely cure any default by Tenant under this Lease; or (ii) Tenant has Defaulted 3 or more times during the period from the date of the exercise of an Extension Right to the date of the commencement of the Extension Term, whether or not such Defaults are cured."

10. Expansion Right.

a. Generally. Tenant shall have the one-time right, but not the obligation, to expand the Premises to include the Third Floor Option Space upon the terms and conditions set forth in this Section 10 ("**Third Floor Expansion Right**"). Tenant shall be entitled to exercise its right under this Section 10 by delivery of written notice to Landlord of such election on or before June 1, 2016 ("**Expansion Notice**"). If Tenant elects to lease the Third Floor Option Space by timely delivering an Expansion Notice to Landlord, Tenant shall be deemed to agree to lease the Third Floor

Option Space on the same general terms and conditions as the Lease, except that (i) the commencement date of the Lease with respect to the Third Floor Option Space shall be August 1, 2016 (the "**Third Floor Option Space Commencement Date**"), (ii) commencing on the Third Floor Option Space Commencement Date, Tenant shall pay Base Rent for the Third Floor Option Space equal to $30.00 per rentable square foot of the Third Floor Option Space per year, (iii) Base Rent payable for the Third Floor Option Space shall be increased on each annual anniversary of the Third Floor Option Space Commencement Date (each, a "**Third Floor Option Space Adjustment Date**"), by multiplying the Base Rent payable for the Third Floor Option Space immediately before the Third Floor Option Space Adjustment Date by 2.5% and adding the resulting amount to the Base Rent payable for the Third Floor Option Space immediately before such Third Floor Option Space Adjustment Date, (iv) commencing on the Third Floor Commencement Date, Tenant's Share of Operating Expenses shall be increased to 48.53%, (v) commencing on the Third Floor Option Space Commencement Date, Tenant shall commence paying Tenant's Share of Operating Expenses with respect to the Third Floor Option Space, (vi) Landlord shall provide to Tenant a tenant improvement allowance in the amount of $50.00 per rentable square foot of the Third Floor Option Space ("**Third Floor Option Space Allowance**") for the construction of tenant improvements in the Premises pursuant to the terms of a work letter substantially in the form of the Fourth Amendment Work Letter as it relates to the Tenant Improvements, and (vii) Tenant shall be entitled, subject to the terms of Section 10 of the original Lease, to its pro rata share of parking spaces with respect to the Third Floor Option Space ("**Third Floor Parking Spaces**"), which Third Floor Parking Spaces shall be (1) subject to the payment of the market rate for each Third Floor Parking Space, as reasonably determined by Landlord from time to time, which as of the Third Floor Option Space Commencement Date shall be $150 per month for each Third Floor Parking Space plus applicable taxes, and (2) located among the parking areas serving the Project, as reasonably determined by Landlord. If Tenant does not timely deliver an Expansion Notice pursuant to this Section 10(a), Tenant shall be deemed to have forever waived its right to expand the Premises pursuant to this Section 10(a) to include the Third Floor Option Space and Tenant's rights under this Section 10(a) shall terminate and be of no further force or effect.

b. Amended Lease. If (i) Tenant fails to timely deliver an Expansion Notice to Landlord, or (ii) after the expiration of a period of 10 business days after Landlord's delivery to Tenant of a lease amendment for Tenants lease of the Third Floor Option Space, no lease amendment acceptable to both parties in their respective reasonable discretion, has been executed, Tenant shall be deemed to have forever waived its right to lease the Third Floor Option Space.

c. Exceptions. Notwithstanding the above, the Third Floor Expansion Right shall, at Landlord's option, not be in effect and may not be exercised by Tenant:

(i) during any period of time that Tenant is in Default under any provision of the Lease; or

(ii) if Tenant has been in Default under any provision of the Lease 3 or more times, whether or not the Defaults are cured, during the 12 month period prior to the date on which Tenant seeks to exercise the Third Floor Expansion Right.

d. Termination. The Third Floor Expansion Right shall, at Landlord's option, terminate and be of no further force or effect even after Tenant's due and timely exercise of the Third Floor Expansion Right, if, after such exercise, but prior to the commencement date of the lease of Third Floor Option Space, (i) Tenant fails to timely cure any default by Tenant under the Lease; or (ii) Tenant has Defaulted 3 or more times during the period from the date of the exercise of the Third Floor Expansion Right to the date of the commencement of the lease of the Third Floor Option Space, whether or not such Defaults are cured.

e. Rights Personal. The Third Floor Expansion Right is personal to Tenant and is not assignable without Landlord's consent, which may be granted or withheld in Landlord's sole discretion separate and apart from any consent by Landlord to an assignment of Tenant's interest in the Lease.

f. No Extensions. The period of time within which the Third Floor Expansion Right may be exercised shall not be extended or enlarged by reason of Tenant's inability to exercise the Third Floor Expansion Right.

11. Asbestos.

a. Notification of Asbestos. Landlord hereby notifies Tenant of the presence of asbestos-containing materials ("**ACMs**") and/or presumed asbestos-containing materials ("**PACMs**") within or about the Premises in the location identified in **Exhibit C** attached to this First Amendment.

b. Tenant Acknowledgement. Tenant hereby acknowledges receipt of the notification in paragraph (a) of this Section 11 and understands that the purpose of such notification is to make Tenant and any agents, employees, and contractors of Tenant, aware of the presence of ACMs and/or PACMs within or about the Building in order to avoid or minimize any damage to or disturbance of such ACMs and/or PACMs.

CMR
Tenant's Initials

c. Acknowledgement from Contractors/Employees. Tenant shall give Landlord at least 14 days' prior written notice before conducting, authorizing or permitting any of the activities listed below within or about the Premises, and before soliciting bids from any person to perform such services. Such notice shall identify or describe the proposed scope, location, date and time of such activities and the name, address and telephone number of each person who may be conducting such activities. Thereafter, Tenant shall grant Landlord reasonable access to the Premises to determine whether any ACMs or PACMs will be disturbed in connection with such activities. Tenant shall not solicit bids from any person for the performance of such activities without Landlord's prior written approval. Upon Landlord's request, Tenant shall deliver to Landlord a copy of a signed acknowledgement from any contractor, agent, or employee of Tenant acknowledging receipt of information describing the presence of ACMs and/or PACMs within or about the Premises in the locations identified in **Exhibit C** prior to the commencement of such activities. Nothing in this Section 11 shall be deemed to expand Tenant's rights under the Lease or otherwise to conduct, authorize or permit any such activities.

(i) Removal of thermal system insulation ("**TSl**") and surfacing ACMs and PACMs (i.e., sprayed-on or troweled-on material, e.g., textured ceiling paint or fireproofing material);

(ii) Removal of ACMs or PACMs that are not TS; or surfacing ACMs or PACMs; or

(iii) Repair and maintenance of operations that are likely to disturb ACMs or PACMs.

12. OFAC. Tenant and all beneficial owners of Tenant are currently (a) in compliance with and shall at all times during the Term of the Lease remain in compliance with the regulations of the Office of Foreign Assets Control ("**OFAC**") of the U.S. Department of Treasury and any statute, executive order, or regulation relating thereto (collectively, the "**OFAC Rules**"), (b) not listed on, and shall not during the term of the Lease be listed on, the Specially Designated Nationals and Blocked Persons List, Foreign Sanctions Evaders List or the Sectoral Sanctions Identifications List, which are all maintained by OFAC and/or on any other similar list maintained by OFAC or other governmental authority pursuant to any authorizing statute, executive order, or regulation, and (c) not a person or entity with whom a U.S. person is prohibited from conducting business under the OFAC Rules.

13. **Brokers.** Landlord and Tenant each represents and warrants that it has not dealt with any broker, agent or other person (collectively, "**Broker**") in connection with the transaction reflected in this Fourth Amendment and that no Broker brought about this transaction, other than Cushman & Wakefield, Flinn Ferguson and Kidder Mathews. Landlord and Tenant each hereby agrees to indemnify and hold the other harmless from and against any claims by any Broker, other than Cushman & Wakefield, Flinn Ferguson and Kidder Mathews, claiming a commission or other form of compensation by virtue of having dealt with Tenant or Landlord, as applicable, with regard to this Fourth Amendment. Landlord shall be responsible for all commissions due to Flinn Ferguson and Kidder Mathews arising out of the execution of this Fourth Amendment in accordance with the terms of separate written agreements between Landlord, on the one hand, and Cushman & Wakefield, Flinn Ferguson and Kidder Mathews, on the other hand.

14. **Miscellaneous.**

a. This Fourth Amendment is the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior and contemporaneous oral and written agreements and discussions. This Fourth Amendment may be amended only by an agreement in writing, signed by the parties hereto.

b. This Fourth Amendment is binding upon and shall inure to the benefit of the parties hereto, and their respective successors and assigns.

c. This Fourth Amendment may be executed in any number of counterparts, each of which shall be deemed an original, but all of which when taken together shall constitute one and the same instrument. The signature page of any counterpart may be detached therefrom without impairing the legal effect of the signature(s) thereon provided such signature page is attached to any other counterpart identical thereto except having additional signature pages executed by other parties to this Fourth Amendment attached thereto.

d. Except as amended and/or modified by this Fourth Amendment, the Lease is hereby ratified and confirmed and all other terms of the Lease shall remain in full force and effect, unaltered and unchanged by this Fourth Amendment. In the event of any conflict between the provisions of this Fourth Amendment and the provisions of the Lease, the provisions of this Fourth Amendment shall prevail. Whether or not specifically amended by this Fourth Amendment, all of the terms and provisions of the Lease are hereby amended to the extent necessary to give effect to the purpose and intent of this Fourth Amendment.

[Signatures are on the next page.]

IN WITNESS WHEREOF, the parties hereto have executed this Fourth Amendment as of the day and year first above written.

TENANT:

ADAPTIVE BIOTECHNOLOGIES CORPORATION,
a Washington corporation

By: /s/ Chad M. Robins
Its: CEO & President

LANDLORD:

ARE-SEATTLE NO. 11, LLC,
a Delaware limited liability company

By: ALEXANDRIA REAL ESTATE EQUITIES, L.P., a Delaware limited partnership
managing member

By: ARE-QRS CORP.,
a Maryland corporation,
general partner

By: /s/ Jackie Clem
Its: Senior Vice President, RE Legal Affairs

LANDLORD'S ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA)
) §
County of Los Angeles)

On December 23, 2015, before me, Charles L Murphy, a Notary Public, personally appeared Jackie Clem who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature of Notary

CHARLES L. MURPHY
Commission # 2116993
Notary Public - California
Los Angeles County
My Comm. Expires Jul 20, 2019

(Affix seal here)

TENANT'S ACKNOWLEDGMENT

STATE OF WA

COUNTY OF King

ss.

On this 21 day of December, 2015, before me personally appeared Lynn Jantzock, to me known to be the EA of Adaptive Biotech, a Biotech company, that executed the within and foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation for the uses and purposes therein mentioned, and on oath stated that they were authorized to execute said instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

(Signature of Notary)

Lorna Chang

(Legibly Print or Stamp Name of Notary)

Notary public in and for the State of Washington, residing at Seattle, WA

My appointment expires 5/11/19

Notary Public
State of Washington
LORNA CHANG
MY COMMISSION EXPIRES
05/11/2019

EXHIBIT A

The Second Expansion Premises

ALEXANDRIA.

EXHIBIT B

Fourth Amendment Work Letter

THIS FOURTH AMENDMENT WORK LETTER dated December 23, 2015 (this **"Fourth Amendment Work Letter")** is made and entered into by and between **ARE-SEATTLE NO. 11, LLC**, a Delaware limited liability company ("**Landlord**"), and **ADAPTIVE BIOTECHNOLOGIES CORPORATION**, a Washington corporation ("**Tenant**"), and is attached to and made a part of the Lease Agreement dated July 21, 2011, as amended by that certain First Amendment to Lease dated as of August 26, 2011, as further amended by that certain Amended and Restated Second Amendment to Lease dated as of June 30, 2014 (the "**Second Amendment**"), as further amended by that certain Third Amendment to Lease dated as of November 5, 2015, and as further amended by that certain Fourth Amendment to Lease dated of even date herewith (the "**Fourth Amendment**") (as amended, the "**Lease**"), by and between Landlord and Tenant. Any initially capitalized terms used but not defined herein shall have the meanings given them in the Lease.

1. **General Requirements.**

(a) **Tenant's Authorized Representative**. Tenant designates Andy Ament, Lorna Chang and Kathleen Determann (each such individual acting alone, "**Tenant's Representative**") as the only persons authorized to act for Tenant pursuant to this Fourth Amendment Work Letter. Landlord shall not be obligated to respond to or act upon any request, approval, inquiry or other communication ("**Communication**") from or on behalf of Tenant in connection with this Fourth Amendment Work Letter unless such Communication is in writing from Tenant's Representative. Tenant may change any Tenant's Representative at any time upon not less than 5 business days advance written notice to Landlord.

(b) **Landlord's Authorized Representative**. Landlord designates John Cox and Jeff Graves (either such individual acting alone, "**Landlord's Representative**") as the only persons authorized to act for Landlord pursuant to this Fourth Amendment Work Letter. Tenant shall not be obligated to respond to or act upon any request, approval, inquiry or other Communication from or on behalf of Landlord in connection with this Fourth Amendment Work Letter unless such Communication is in writing from Landlord's Representative. Landlord may change either Landlord's Representative at any time upon not less than 5 business days advance written notice to Tenant.

(c) **Architects, Consultants and Contractors**. Landlord and Tenant hereby acknowledge and agree that the architect (the "**TI Architect**") for the Tenant Improvements (as defined in Section 2(a) below), the general contractor and any subcontractors for the Tenant Improvements shall be selected by Tenant, subject to Landlord's approval, which approval shall not be unreasonably withheld, conditioned or delayed. Landlord shall be named a third party beneficiary of any contract entered into by Tenant with the TI Architect, any consultant, any contractor or any subcontractor, and of any warranty made by any contractor or any subcontractor.

2. **Tenant Improvements**.

(a) **Tenant Improvements Defined**. As used herein, "**Tenant Improvements**" shall mean all improvements to any portion of the Premises and the Building Signs desired by Tenant of a fixed and permanent nature performed after the date of the Fourth Amendment. Other than funding the TI Allowance (as defined below) as provided herein, Landlord shall not have any obligation whatsoever with respect to the finishing of the Premises for Tenant's use and occupancy.

(b) **Tenant's Space Plans**. Tenant shall deliver to Landlord schematic drawings and outline specifications (the "**TI Design Drawings**") detailing Tenant's requirements for the Tenant Improvements within 15 days of the date hereof. Not more than 10 days thereafter, Landlord shall deliver to Tenant the

written objections, questions or comments of Landlord and the TI Architect with regard to the TI Design Drawings. Tenant shall cause the TI Design Drawings to be revised to address such written comments and shall resubmit said drawings to Landlord for approval within 10 days thereafter. Such process shall continue until Landlord has approved the TI Design Drawings.

(c) **Working Drawings**. Not later than 15 business days following the approval of the TI Design Drawings by Landlord, Tenant shall cause the TI Architect to prepare and deliver to Landlord for review and comment construction plans, specifications and drawings for the Tenant Improvements ("**TI Construction Drawings**"), which TI Construction Drawings shall be prepared substantially in accordance with the TI Design Drawings. Tenant shall be solely responsible for ensuring that the TI Construction Drawings reflect Tenant's requirements for the Tenant Improvements. Landlord shall deliver its written comments on the TI Construction Drawings to Tenant not later than 10 business days after Landlord's receipt of the same; provided, however, that Landlord may not disapprove any matter that is consistent with the TI Design Drawings. Tenant and the TI Architect shall consider all such comments in good faith and shall, within 10 business days after receipt, notify Landlord how Tenant proposes to respond to such comments. Any disputes in connection with such comments shall be resolved in accordance with Section 2(d), hereof. Provided that the design reflected in the TI Construction Drawings is consistent with the TI Design Drawings, Landlord shall approve the TI Construction Drawings submitted by Tenant. Once approved by Landlord, subject to the provisions of Section 4 below, Tenant shall not materially modify the TI Construction Drawings except as may be reasonably required in connection with the issuance of the TI Permit (as defined in Section 3(a) below).

(d) **Approval and Completion**. If any dispute regarding the design of the Tenant Improvements is not settled within 10 business days after notice of such dispute is delivered by one party to the other, Tenant may make the final decision regarding the design of the Tenant Improvements, provided (i) Tenant acts reasonably and such final decision is either consistent with or a compromise between Landlord's and Tenant's positions with respect to such dispute, (ii) that all costs and expenses resulting from any such decision by Tenant shall be payable out of the TI Fund (as defined in Section 5(d) below), and (iii) Tenant's decision will not affect the base Building, structural components of the Building or any Building Systems (in which case Landlord shall make the final decision). Any changes to the TI Construction Drawings following Landlord's and Tenant's approval of same requested by Tenant shall be processed as provided in Section 4 hereof.

3. **Performance of the Tenant Improvements**.

(a) **Commencement and Permitting of the Tenant Improvements**. Tenant shall commence construction of the Tenant Improvements upon obtaining and delivering to Landlord a building permit (the "**TI Permit**") authorizing the construction of the Tenant Improvements consistent with the TI Construction Drawings approved by Landlord. The cost of obtaining the TI Permit shall be payable from the TI Fund. Landlord shall assist Tenant in obtaining the TI Permit. Prior to the commencement of the Tenant Improvements, Tenant shall deliver to Landlord a copy of any contract with Tenant's contractors (including the TI Architect), and certificates of insurance from any contractor performing any part of the Tenant Improvement evidencing industry standard commercial general liability, automotive liability, "builder's risk", and workers' compensation insurance. Tenant shall cause the general contractor to provide a certificate of insurance naming Landlord, Alexandria Real Estate Equities, Inc., and Landlord's lender (if any) as additional insureds for the general contractor's liability coverages required above.

(b) **Selection of Materials, Etc**. Where more than one type of material or structure is indicated on the TI Construction Drawings approved by Tenant and Landlord, the option will be within Tenant's reasonable discretion if the matter concerns the Tenant improvements, and within Landlord's sole and absolute subjective discretion if the matter concerns the structural components of the Building or any Building Systems.

(c) **Tenant Liability**. During the Term of the Lease, Tenant agrees to enforce its rights under any contract Tenant enters into with the TI Architect or any contractor with respect to the Tenant Improvements and enforce any warranties thereunder with respect to correcting any deficiencies or defects in the Tenant Improvements.

(d) **Substantial Completion**. Tenant shall substantially complete or cause to be substantially completed the Tenant Improvements in a good and workmanlike manner, in accordance with the TI Permit subject, in each case, to Minor Variations and normal "punch list" items of a non-material nature which do not interfere with the use of the Premises ("**Substantial Completion**" or "**Substantially Complete**"). Upon Substantial Completion of the Tenant Improvements, Tenant shall require the TI Architect and the general contractor to execute and deliver, for the benefit of Tenant and Landlord, a Certificate of Substantial Completion in the form of the American Institute of Architects ("**AIA**") document G704. For purposes of this Fourth Amendment Work Letter, "**Minor Variations**" shall mean any modifications reasonably required: (i) to comply with all applicable Legal Requirements and/or to obtain or to comply with any required permit (including the TI Permit); (ii) to comport with good design, engineering, and construction practices which are not material; or (iii) to make reasonable adjustments for field deviations or conditions encountered during the construction of the Tenant Improvements.

4. **Changes**. Following the approval by Landlord of the TI Design Drawings, any changes to the Tenant improvements desired by Tenant that would affect the Building structure or Building Systems ("**Changes**") shall be subject to the written approval of Landlord, which approval may be granted or withheld in Landlord's sole and absolute discretion. Any such Changes requested by Tenant, shall be requested and instituted in accordance with the provisions of this Section 4.

(a) **Tenant's Right to Request Changes**. If Tenant shall request Changes, Tenant shall request such Changes by notifying Landlord in writing in substantially the same form as the AIA standard change order form (a "**Change Request**"), which Change Request shall detail the nature and extent of any such Change. Such Change Request must be signed by Tenant's Representative. Landlord shall review and approve or disapprove such Change Request within 10 business days thereafter, provided that Landlord's approval shall not be unreasonably withheld, conditioned or delayed.

(b) **Implementation of Changes**. If Landlord approves such Change and Tenant deposits with Landlord any Excess TI Costs (as defined in Section 5(d) below) required in connection with such Change, Tenant may cause the approved Change to be instituted. If any TI Permit modification or change is required as a result of such Change, Tenant shall promptly provide Landlord with a copy of such TI Permit modification or change.

5. **Costs**.

(a) **Budget For Tenant Improvements**. Before the commencement of construction of the Tenant Improvements, Tenant shall obtain a detailed breakdown, by trade, of the costs incurred or that will be incurred, in connection with the design and construction of the Tenant Improvements (the "**Budget**"), and deliver a copy of the Budget to Landlord for Landlord's approval, which shall not be unreasonably withheld or delayed_ The Budget shall be based upon the TI Construction Drawings approved by Landlord. The Budget shall include a payment to Landlord of administrative rent ("**Administrative Rent**") equal to 1% of the TI Costs (as hereinafter defined), not to exceed $37,650 in the aggregate, for monitoring and inspecting the construction of the Tenant Improvements, which sum shall be payable from the TI Fund. Such Administrative Rent shall include, without limitation, all out-of-pocket costs, expenses and fees incurred by or on behalf of Landlord arising from, out of, or in connection with, such monitoring of the construction of the Tenant Improvements. If the Budget is greater than the TI Allowance, Tenant shall deposit with Landlord the difference, in cash, prior to the commencement of construction of the Tenant Improvements, for disbursement by Landlord as described in Section 5(d).

(b) **TI Allowance**. Landlord shall provide to Tenant a tenant improvement allowance (collectively, the "**TI Allowance**") as follows:

1. a "**Tenant Improvement Allowance**" in the maximum amount of $138.93 per rentable square foot in the Second Expansion Premises, or $3,903,933 in the aggregate, which is included in the Base Rent set forth in the Lease; and

2. an "**Additional Tenant Improvement Allowance**" in the maximum amount of $50.00 per rentable square foot in the Second Expansion Premises, or $1,405,000 in the aggregate, which shall, to the extent used, result in Additional Rent as set forth in the Lease.

The TI Allowance shall be disbursed in accordance with this Fourth Amendment Work Letter. Tenant shall have no right to the use or benefit (including any reduction to Base Rent) of any portion of the TI Allowance not required for the design and construction of (i) the Tenant Improvements described in the TI Construction Drawings approved pursuant to Section 2(d) or (ii) any Changes pursuant to Section 4. Tenant shall have no right to any portion of the TI Allowance that is not disbursed before the last day of the month that is 12 months after the Second Expansion Premises Commencement Date.

(c) **Costs Includable in TI Fund**. The TI Fund shall be used solely for the payment of design, permits and construction costs in connection with the construction of the Tenant Improvements, including, without limitation, the cost of electrical power and other utilities used in connection with the construction of the Tenant Improvements, the cost of preparing the TI Design Drawings and the TI Construction Drawings, all costs set forth in the Budget, including Landlord's Administrative Rent, and the cost of Changes (collectively, "**TI Costs**"). Notwithstanding anything to the contrary contained herein, the TI Fund shall not be used to purchase any furniture, personal property or other non-Building system materials or equipment, including, but not limited to, Tenant's voice or data cabling, non-ducted biological safety cabinets and other scientific equipment not incorporated into the Tenant Improvements

(d) **Excess TI Costs**. Landlord shall have no obligation to bear any portion of the cost of any of the Tenant Improvements except to the extent of the TI Allowance. If at any time and from time-to-time, the remaining TI Costs under the Budget exceed the remaining unexpended TI Allowance, Tenant shall deposit with Landlord, as a condition precedent to Landlord's obligation to fund the TI Allowance, 100% of the then current TI Cost in excess of the remaining T1 Allowance ("**Excess TI Costs**"). If Tenant fails to deposit, or is late in depositing any Excess TI Costs with Landlord, Landlord shall have all of the rights and remedies set forth in the Lease for nonpayment of Rent (including, but not limited to, the right to interest at the Default Rate and the right to assess a late charge). For purposes of any litigation instituted with regard to such amounts, those amounts will be deemed Rent under the Lease. The TI Allowance and Excess TI Costs is herein referred to as the "**TI Fund**." Funds deposited by Tenant shall be the first thereafter disbursed to pay TI Costs. Notwithstanding anything to the contrary set forth in this Section 5(d), Tenant shall be fully and solely liable for TI Costs and the cost of Minor Variations in excess of the TI Allowance, If upon Substantial Completion of the Tenant Improvements and the payment of all sums due in connection therewith there remains any undisbursed portion of the TI Fund, Tenant shall be entitled to such undisbursed Tl Fund solely to the extent of any Excess TI Costs deposit Tenant has actually made with Landlord.

(e) **Payment for TI Costs**. During the course of design and construction of the Tenant Improvements, Landlord shall reimburse Tenant for TI Costs once a month against a draw request in Landlord's standard form, containing evidence of payment of such TI Costs by Tenant and such certifications, lien waivers (including a conditional lien release for each progress payment and unconditional lien releases for the prior month's progress payments), inspection reports and other matters as Landlord reasonably and customarily obtains, to the extent of Landlord's approval thereof for payment, no later than 30 days following receipt of such draw request. Upon completion of the Tenant Improvements (and prior to any final disbursement of the TI Fund), Tenant shall deliver to Landlord: (i) sworn statements setting forth the names of all contractors and first tier subcontractors who did the work and final, unconditional lien waivers from all such contractors and first tier subcontractors; (ii) as-built plans (one copy in print format and two copies in electronic CAD format) for such Tenant Improvements, (iii) a certification of substantial completion in Form AlA G704, (iv) a certificate or temporary of occupancy for the Premises (or an equivalent approval); and (v) copies of all operation and maintenance manuals and warranties affecting the Premises.

6. **Miscellaneous**.

(a) **Consents**. Whenever consent or approval of either party is required under this Fourth Amendment Work Letter, that party shall not unreasonably withhold, condition or delay such consent or approval, except as may be expressly set forth herein to the contrary.

(b) **Modification**. No modification, waiver or amendment of this Fourth Amendment Work Letter or of any of its conditions or provisions shall be binding upon Landlord or Tenant unless in writing signed by Landlord and Tenant.

(c) **No Default Funding**. In no event shall Landlord have any obligation to fund any portion of the TI Allowance during any period that Tenant is in Default under the Lease.

Exhibit C

Asbestos Disclosure

NOTIFICATION OF THE PRESENCE OF ASBESTOS CONTAINING MATERIALS

This notification provides certain information about asbestos within or about the Premises at 1551 Eastlake Avenue, Seattle, WA ("Building") and in accordance with Washington Administrative Code, Chapter 296-62-07721.

Historically, asbestos was commonly used in building products used in the construction of buildings across the country. Asbestos-containing building products were used because they are fire-resistant and provide good noise and temperature insulation. Because of their prevalence, asbestos-containing materials, or ACMs, are still sometimes found in buildings today.

An asbestos survey of the Building has determined that ACMs and/or materials that might contain ACMs, referred to as presumed asbestos-containing materials or PACMs, are present within or about the Premises as follows:

Material Description	Material Location
Floor Mastic (not covered by floor tile)	Various locations within the parking garage
Flooring Material and Mastic beneath new floor tile (PALM)	Landings of stairwells #1 and #2

Because AGMs and PACMs are present and may continue to be present within or about the Building, we have hired an independent environmental consulting firm to prepare an operations and maintenance program ("**O&M Program**"). The O&M Program is designed to minimize the potential of any harmful asbestos exposure to any person within or about the Building. The O&M Program includes a description of work methods to be taken in order to maintain any ACMs or PACMs within or about the Building in good condition and to prevent any significant disturbance of such ACMs or PACMs. Appropriate personnel receive regular periodic training on how to properly administer the O&M Program.

The O&M Program describes the risks associated with asbestos exposure and how to prevent such exposure through appropriate work practices. ACMs and PACMs generally are not thought to be a threat to human health unless asbestos fibers are released into the air and inhaled. This does not typically occur unless (1) the ACMs are in a deteriorating condition, or (2) the AGMs have been significantly disturbed (such as through abrasive cleaning, or maintenance or renovation activities). If inhaled, asbestos fibers can accumulate in the lungs and, as exposure increases, the risk of disease (such as asbestosis or cancer) increases. However, measures to minimize exposure, and consequently minimize the accumulation of asbestos fibers, reduce the risks of adverse health effects.

The O&M Program describes a number of activities that should be avoided in order to prevent a release of asbestos fibers. In particular, you should be aware that some of the activities which may present a health risk include moving, drilling, boring, or otherwise disturbing ACMs. Consequently, such activities should not be attempted by any person not qualified to handle ACMs.

The O&M Program is available for review during regular business hours at our office located at 1600 Fairview Avenue East, Suite 100, Seattle WA 98102.

Exhibit D

Third Floor Option Space

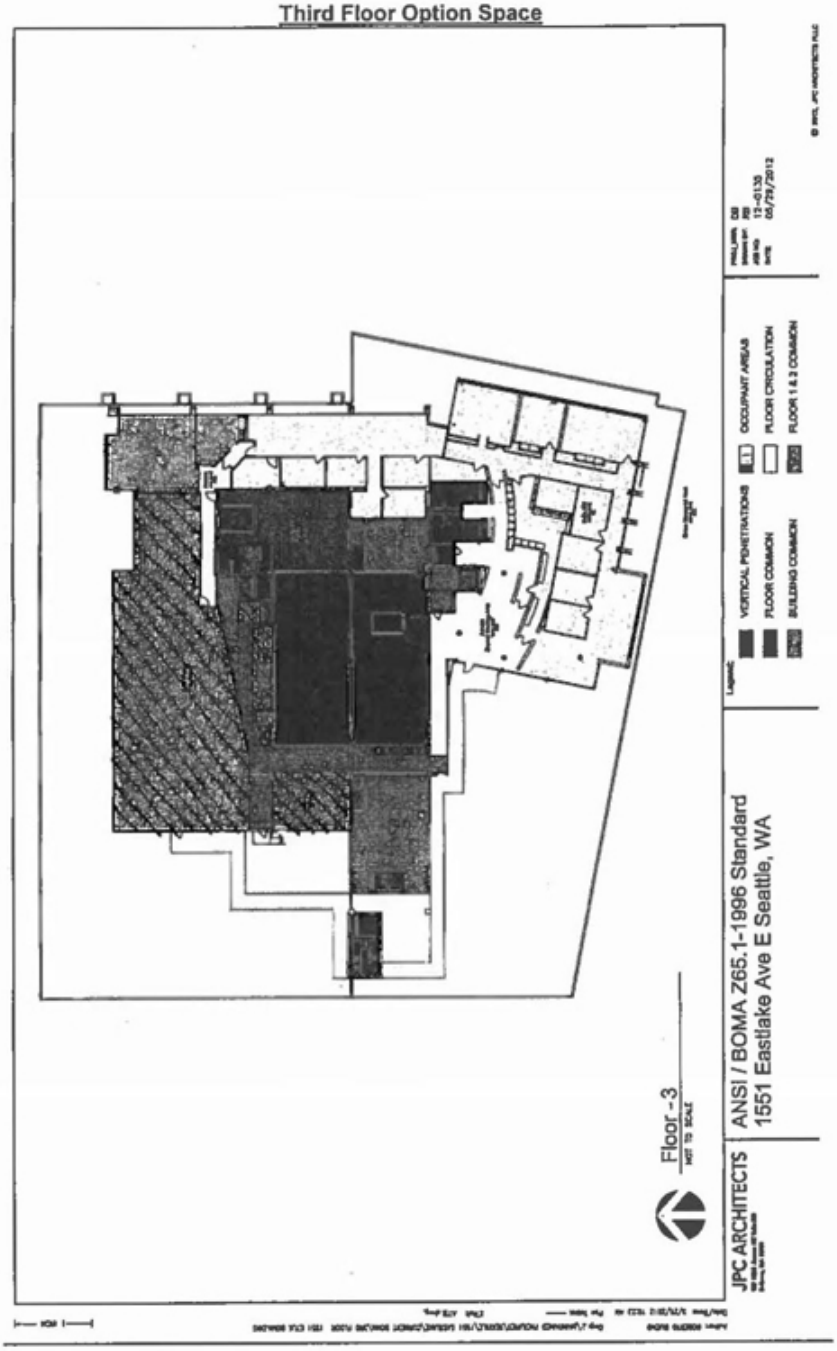
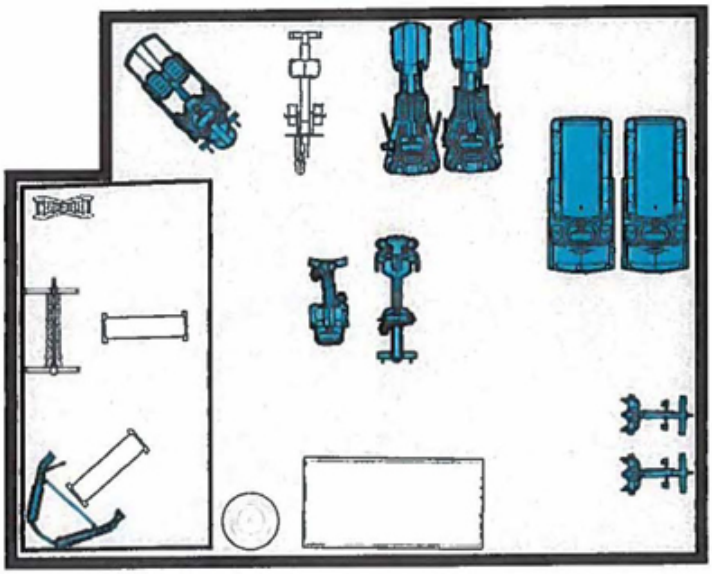


Exhibit E

Landlord's Work - Gym Area



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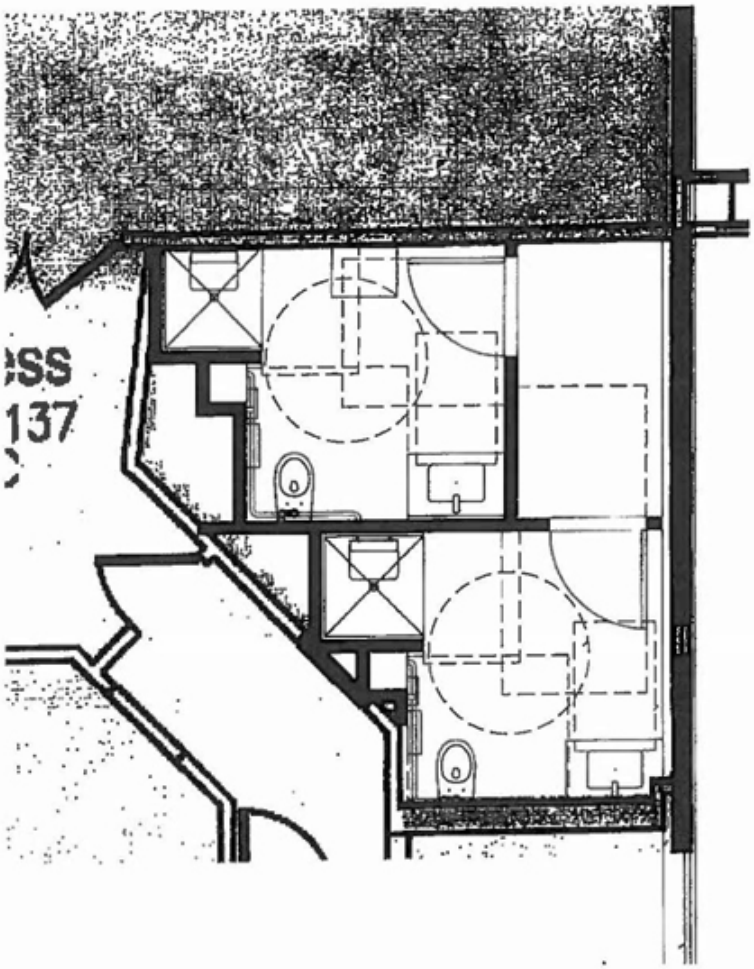
PRECOR

Adaptive Biotechnologies

Created for Mr. John Cox, Alexandria Real Estate by mark wiper

This floor plan is a representation and should not be relied on exclusively. Measurements should be verified to ensure accuracy.

SABArchitects
1124 Eastlake Ave East Suite 201
Seattle, WA 98109
206 957 6400
206 957 6404



PLAN
SCALE: 1/4" = 1'-0"

REVIEW 09 NOV 15

1551 SHOWERS

1551 EASTLAKE AVE
SEATTLE, WA

PLAN

SCALE: AS NOTED
DRAWN: SAE
CHECKED:
PROJ NO: 03008.22

SK-1

FIFTH AMENDMENT TO LEASE

THIS FIFTH AMENDMENT TO LEASE (this "**Fifth Amendment**") is made as of June 6, 2016, by and between **ARE-SEATTLE NO. 11, LLC**, a Delaware limited liability company ("**Landlord**"), and **ADAPTIVE BIOTECHNOLOGIES CORPORATION,** a Washington corporation ("**Tenant**").

RECITALS

A. Landlord and Tenant are now parties to that certain Lease Agreement dated as of July 21, 2011, as amended by that certain First Amendment to Lease dated as of August 26, 2011, as further amended by that certain Amended and Restated Second Amendment to Lease dated as of June 30, 2014, as further amended by that certain Third Amendment to Lease dated as of November 5, 2015 (the "**Third Amendment**"), and as further amended by that certain Fourth Amendment to Lease dated as of December 23, 2015 (the "**Fourth Amendment**") (as amended, the "**Lease**"). Pursuant to the Lease, Tenant leases certain premises consisting of approximately 48,424 rentable square feet ("**Current Premises**") on the second and third floors of that certain building located at 1551 Eastlake Avenue, Seattle, Washington. The Current Premises are more particularly described in the Lease. Capitalized terms used herein without definition shall have the meanings defined for such terms in the Lease.

B. Landlord and Tenant desire, subject to the terms and conditions set forth below, to amend the Lease to, among other things, expand the size of the Current Premises by adding that portion of the third floor of the Building consisting of approximately 8,594 rentable square feet, as shown on **Exhibit A** attached to this Fifth Amendment ("**Third Expansion Premises**").

NOW, THEREFORE, in consideration of the foregoing Recitals, which are incorporated herein by this reference, the mutual promises and conditions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Landlord and Tenant hereby agree as follows:

1. **Third Expansion Premises**. In addition to the Current Premises, commencing on the Third Expansion Premises Commencement Date (as defined below), Landlord leases to Tenant, and Tenant leases from Landlord, the Third Expansion Premises.

2. **Delivery**. As of the date of this Fifth Amendment, Tenant is occupying the Third Expansion Premises pursuant to the terms of the Third Amendment. The "**Third Expansion Premises Commencement Date**" shall be the date that is 1 business day after the mutual execution and delivery of this Fifth Amendment by the parties, Tenant's occupancy of the Third Expansion Premises shall be pursuant to the terms of this Fifth Amendment (and no longer pursuant to the terms of the Third Amendment) as of the Third Expansion Premises Commencement Date. The "**Third Expansion Premises Rent Commencement Date**" shall be August 1, 2016. Upon the request of Landlord, Tenant shall execute and deliver a written acknowledgment of the Third Expansion Premises Commencement Date and the Third Expansion Premises Rent Commencement Date in substantially the form of the "Acknowledgement of Commencement Date" attached to the Lease as **Exhibit D**; provided, however, Tenant's failure to execute and deliver such acknowledgment shall not affect either party's rights hereunder.

Except as set forth in the Fifth Amendment Work Letter: (i) Landlord shall have no obligation for any defects in the Third Expansion Premises; and (ii) Tenant's occupancy of the Third Expansion Premises immediately prior to the Third Expansion Premises Commencement Date shall be conclusive evidence that Tenant accepts the Third Expansion Premises and that the Third Expansion Premises were in good condition at the time possession was taken.

Tenant agrees and acknowledges that, except as otherwise expressly set forth in this Fifth Amendment or in the Lease, neither Landlord nor any agent of Landlord has made any representation or warranty with respect to the condition of all or any portion of the Third Expansion Premises, and/or the suitability of the Third Expansion Premises for the conduct of Tenant's business, and Tenant waives any implied warranty that the Third Expansion Premises are suitable for the Permitted Use.

3. **Premises and Rentable Area of Premises**. Commencing on the Third Expansion Premises Commencement Date, the defined terms "**Premises**" and "**Rentable Area of Premises**" on page 1 of the Lease shall be deleted in their entirety and replaced with the following:

"**Premises**: That portion of the Building containing approximately 57,018 rentable square feet, consisting of (i) that certain portion of the second floor containing approximately 7,724 rentable square feet (the "**Original Premises**"), (ii) that certain portion of the second floor containing approximately 12,600 rentable square feet (the "**Expansion Premises**"), (iii) those certain portions of the second and third floors containing approximately 28,100 rentable square feet (the "**Second Expansion Premises**"), and (iv) that certain portion of the third floor consisting of approximately 8,594 rentable square feet (the "**Third Expansion Premises**"), all as shown on **Exhibit A**."

"**Rentable Area of Premises**: 57,018 sq. ft."

As of the Third Expansion Premises Commencement Date, **Exhibit A** to the Lease shall be amended to include the Third Expansion Premises as shown on **Exhibit A** attached to this Fifth Amendment.

4. **Base Term** Commencing on the Third Expansion Premises Commencement Date, the defined term "**Base Term**" on page 1 of the Lease is deleted in its entirety and replaced with the following:

"**Base Term**: Commencing (i) with respect to the Original Premises on the Commencement Date, (ii) with respect to the Expansion Premises on the Expansion Premises Commencement Date, (iii) with respect to the Second Expansion Premises on the Second Expansion Premises Commencement Date, and (iv) with respect to the Third Expansion Premises on the Third Expansion Premises Commencement Date, and ending with respect to the entire Premises on June 1, 2023."

5. **Base Rent.**

a. **Current Premises**. Tenant shall continue to pay Base Rent for the Current Premises as provided for in the Lease.

b. **Third Expansion Premises**. Commencing on the Third Expansion Premises Rent Commencement Date, Tenant shall pay Base Rent for the Third Expansion Premises at the rate of $30.00 per rentable square foot of the Third Expansion Premises per year. Base Rent payable for the Third Expansion Premises shall be increased on each annual anniversary of the Third Expansion Premises Rent Commencement Date (each, a "**Third Expansion Premises Adjustment Date**"), by multiplying the Base Rent payable for the Third Expansion Premises immediately before the Third Expansion Premises Adjustment Date by 2.5% and adding the resulting amount to the Base Rent payable for the Third Expansion Premises immediately before the Third Expansion Premises Adjustment Date.

6. **Tenant's Share**. Commencing on the Third Expansion Premises Commencement Date, the defined term "**Tenant's Share of Operating Expenses**" on page 1 of the Lease shall be deleted in its entirety and replaced with the following:

"**Tenant's Share of Operating Expenses:** 48.53%"

7. **Parking**. Subject to all matters of record, Force Majeure, a Taking and the exercise by Landlord of its rights hereunder, Landlord shall make available to Tenant and Tenant shall, in addition to the parking spaces that Tenant has the right to use pursuant to Section 10 of the original Lease, the Expansion Premises Parking Spaces which Tenant has the right to use pursuant to Section 2 of the Second Amendment, and the Second Expansion Premises Parking Spaces which Tenant has a right to use pursuant to Section 7 of the Fourth Amendment, be entitled to use, subject to the terms of Section 10 of the original Lease, Tenant's pro rata share of parking spaces with respect to the Third Expansion Premises. As of the Third Expansion Premises Commencement Date, Tenant's pro rata share of parking spaces with respect to the Third Expansion Premises shall be equal to 2 parking spaces per 1,000 rentable square feet of the Third Expansion Premises ("**Third Expansion Premises Parking Spaces**"). The Third Expansion Premises Parking Spaces shall be allocated as reasonably determined by Landlord among the Underground Parking, Surface Parking, Northeast Parking and Offsite Parking. Tenant's use of the Third Expansion Premises Parking Spaces shall be subject to the payment by Tenant of the market rate for each Third Expansion Premises Parking Space, as reasonably determined by Landlord from time to time, which as of the date of this Fifth Amendment shall be $150 per month for each Third Expansion Premises Parking Space plus applicable taxes.

8. **Tenant Improvements**. Tenant shall have the right to construct certain Tenant Improvements in the Premises, including the Third Expansion Premises, pursuant to the Fifth Amendment Work Letter attached hereto as **Exhibit B**.

9. **OFAC**. Tenant and all beneficial owners of Tenant are currently (a) in compliance with and shall at all times during the Term of the Lease remain in compliance with the regulations of the Office of Foreign Assets Control ("**OFAC**") of the U.S. Department of Treasury and any statute, executive order, or regulation relating thereto (collectively, the "**OFAC Rules**"), (b) not listed on, and shall not during the term of the Lease be listed on, the Specially Designated Nationals and Blocked Persons List, Foreign Sanctions Evaders List or the Sectoral Sanctions Identifications List, which are all maintained by OFAC and/or on any other similar list maintained by OFAC or other governmental authority pursuant to any authorizing statute, executive order, or regulation, and (c) not a person or entity with whom a U.S. person is prohibited from conducting business under the OFAC Rules.

10. **Brokers**. Landlord and Tenant each represents and warrants that it has not dealt with any broker, agent or other person (collectively, "**Broker**") in connection with the transaction reflected in this Fifth Amendment and that no Broker brought about this transaction, other than Cushman & Wakefield, Flinn Ferguson and Kidder Mathews. Landlord and Tenant each hereby agrees to indemnify and hold the other harmless from and against any claims by any Broker, other than Cushman & Wakefield, Flinn Ferguson and Kidder Mathews, claiming a commission or other form of compensation by virtue of having dealt with Tenant or Landlord, as applicable, with regard to this Fifth Amendment. Landlord shall be responsible for all commissions due to Flinn Ferguson and Kidder Mathews arising out of the execution of this Fifth Amendment in accordance with the terms of separate written agreements between Landlord, on the one hand, and Cushman & Wakefield, Flinn Ferguson and Kidder Mathews, on the other hand.

11. **Miscellaneous**.

a. This Fifth Amendment is the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior and contemporaneous oral and written agreements and discussions. This Fifth Amendment may be amended only by an agreement in writing, signed by the parties hereto.

b. This Fifth Amendment is binding upon and shall inure to the benefit of the parties hereto, and their respective successors and assigns.

c. This Fifth Amendment may be executed in any number of counterparts, each of which shall be deemed an original, but all of which when taken together shall constitute one and the same instrument. The signature page of any counterpart may be detached therefrom without impairing the legal effect of the signature(s) thereon provided such signature page is attached to any other counterpart identical thereto except having additional signature pages executed by other parties to this Fifth Amendment attached thereto.

d. Except as amended and/or modified by this Fifth Amendment, the Lease is hereby ratified and confirmed and all other terms of the Lease shall remain in full force and effect, unaltered and unchanged by this Fifth Amendment. In the event of any conflict between the provisions of this Fifth Amendment and the provisions of the Lease, the provisions of this Fifth Amendment shall prevail. Whether or not specifically amended by this Fifth Amendment, all of the terms and provisions of the Lease are hereby amended to the extent necessary to give effect to the purpose and intent of this Fifth Amendment.

[Signatures are on the next page.]

IN WITNESS WHEREOF, the parties hereto have executed this Fifth Amendment as of the day and year first above written.

TENANT:

ADAPTIVE BIOTECHNOLOGIES CORPORATION, a Washington corporation

By: /s/ Chad M. Robins
Its: CEO & President

LANDLORD:

ARE-SEATTLE NO. 11, LLC,
a Delaware limited liability company

By: ALEXANDRIA REAL ESTATE EQUITIES, L.P., a Delaware limited partnership
managing member

By: ARE-QRS CORP.,
a Maryland corporation, general partner

By: /s/ Jackie Clem
Its: Senior Vice President, RE Legal Affairs

LANDLORD'S ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA)
) §
County of Los Angeles)

On June 6, 2016, before me, Teryll E. Sacks, a Notary Public, personally appeared Jackie Chew who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature of Notary

TERYLL ELIZABETH SACKS
Commission # 2130439
Notary Public - California
Los Angeles County
My Comm. Expires Oct 16, 2019

(Affix seal here)

TENANT'S ACKNOWLEDGMENT

STATE OF WA

COUNTY OF King

ss.

On this 2nd day of June, 2016, before me personally appeared Chad Cohen, to me known to be the NA of NA, a NA, that executed the within and foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation for the uses and purposes therein mentioned, and on oath stated that they were authorized to execute said instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

Martha A Cesar
(Signature of Notary)

Notary Public
State of Washington
Martha A. Cesar
MY COMMISSION EXPIRES
Oct. 10, 2016

Martha A Cesar
(Legibly Print or Stamp Name of Notary)

Notary public in and for the State of Washington,
residing at Seattle WA

My appointment expires 10-10-2016

EXHIBIT A

The Third Expansion Premises

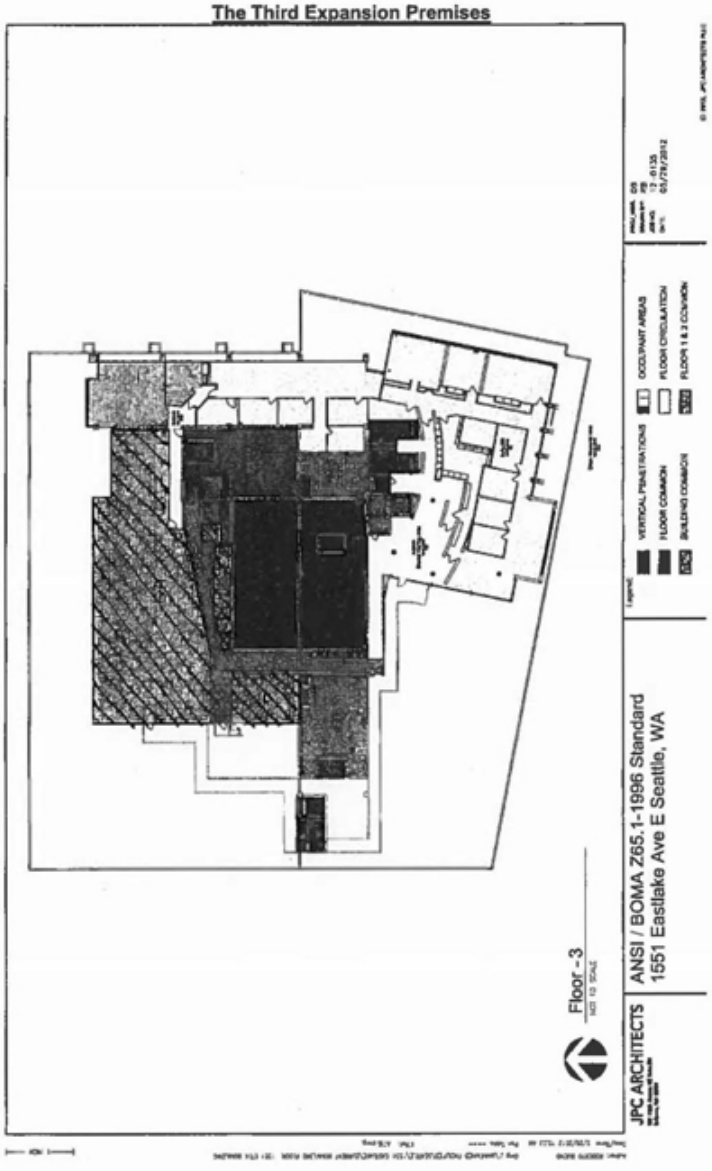


EXHIBIT B

Fifth Amendment Work Letter

THIS FIFTH AMENDMENT WORK LETTER dated May , 2016 (this "**Fifth Amendment Work Letter**") is made and entered into by and between **ARE-SEATTLE NO. 11, LLC**, a Delaware limited liability company ("**Landlord**"), and **ADAPTIVE BIOTECHNOLOGIES CORPORATION**, a Washington corporation ("**Tenant**"), and is attached to and made a part of the Lease Agreement dated July 21, 2011, as amended by that certain First Amendment to Lease dated as of August 26, 2011, as further amended by that certain Amended and Restated Second Amendment to Lease dated as of June 30, 2014 (the "Second Amendment"), as further amended by that certain Third Amendment to Lease dated as of November 5, 2015, as further amended by that certain Fourth Amendment to Lease dated as of December 23, 2015, and as further amended by that certain Fifth Amendment to Lease dated of even date herewith (the "**Fifth Amendment**") (as amended, the "**Lease**"), by and between Landlord and Tenant. Any initially capitalized terms used but not defined herein shall have the meanings given them in the Lease.

1. **General Requirements**.

(a) **Tenant's Authorized Representative**. Tenant designates Andy Ament, Chad Cohen and Brian Finrow (each such individual acting alone, "**Tenant's Representative**") as the only persons authorized to act for Tenant pursuant to this Fifth Amendment Work Letter. Landlord shall not be obligated to respond to or act upon any request, approval, inquiry or other communication ("**Communication**") from or on behalf of Tenant in connection with this Fifth Amendment Work Letter unless such Communication is in writing from Tenant's Representative. Tenant may change any Tenant's Representative at any time upon not less than 5 business days advance written notice to Landlord.

(b) **Landlord's Authorized Representative**. Landlord designates John Cox ("**Landlord's Representative**") as the only person authorized to act for Landlord pursuant to this Fifth Amendment Work Letter. Tenant shall not be obligated to respond to or act upon any request, approval, inquiry or other Communication from or on behalf of Landlord in connection with this Fifth Amendment Work Letter unless such Communication is in writing from Landlord's Representative. Landlord may change or add an additional Landlord's Representative at any time upon not less than 5 business days advance written notice to Tenant.

(c) **Architects, Consultants and Contractors**. Landlord and Tenant hereby acknowledge and agree that the architect (the "**TI Architect**") for the Tenant Improvements (as defined in Section 2(a) below), the general contractor and any subcontractors for the Tenant Improvements shall be selected by Tenant, subject to Landlord's approval, which approval shall not be unreasonably withheld, conditioned or delayed. Landlord shall be named a third party beneficiary of any contract entered into by Tenant with the TI Architect, any consultant, any contractor or any subcontractor, and of any warranty made by any contractor or any subcontractor.

2. **Tenant Improvements**.

(a) **Tenant Improvements Defined**. As used herein, "**Tenant Improvements**" shall mean all improvements to the Premises desired by Tenant of a fixed and permanent nature. Other than funding the Tenant Improvement Allowance (as defined below) as provided herein, Landlord shall not have any obligation whatsoever with respect to the finishing of the Premises (including the Third Expansion Premises) for Tenant's use and occupancy.

(b) **Tenant's Space Plans**. Tenant shall deliver to Landlord schematic drawings and outline specifications (the "**TI Design Drawings**") detailing Tenant's requirements for the Tenant Improvements within 15 days of the date hereof. Not more than 10 days thereafter, Landlord shall deliver to Tenant the written objections, questions or comments of Landlord and the TI Architect with regard to the TI Design Drawings. Tenant shall cause the TI Design Drawings to be revised to address such written comments and shall resubmit said drawings to Landlord for approval within 10 days thereafter. Such process shall continue until Landlord has approved the TI Design Drawings.

(c) **Working Drawings**. Not later than 15 business days following the approval of the TI Design Drawings by Landlord, Tenant shall cause the TI Architect to prepare and deliver to Landlord far review and comment construction plans, specifications and drawings for the Tenant Improvements ("**TI Construction Drawings**"), which TI Construction Drawings shall be prepared substantially in accordance with the TI Design Drawings. Tenant shall be solely responsible for ensuring that the TI Construction Drawings reflect Tenant's requirements for the Tenant Improvements. Landlord shall deliver its written comments on the T1 Construction Drawings to Tenant not later than 10 business days after Landlord's receipt of the same; provided, however, that Landlord may not disapprove any matter that is consistent with the TI Design Drawings. Tenant and the TI Architect shall consider all such comments in good faith and shall, within 10 business days after receipt, notify Landlord how Tenant proposes to respond to such comments. Any disputes in connection with such comments shall be resolved in accordance with Section 2(d) hereof. Provided that the design reflected in the TI Construction Drawings is consistent with the TI Design Drawings, Landlord shall approve the TI Construction Drawings submitted by Tenant. Once approved by Landlord, subject to the provisions of Section 4 below, Tenant shall not materially modify the TI Construction Drawings except as may be reasonably required in connection with the issuance of the TI Permit (as defined in Section 3(a) below).

(d) **Approval and Completion**. If any dispute regarding the design of the Tenant Improvements is not settled within 10 business days after notice of such dispute is delivered by one party to the other, Tenant may make the final decision regarding the design of the Tenant Improvements, provided (i) Tenant acts reasonably and such final decision is either consistent with or a compromise between Landlord's and Tenant's positions with respect to such dispute, (ii) that all costs and expenses resulting from any such decision by Tenant shall be payable out of the TI Fund (as defined in Section 5(d) below), and (iii) Tenant's decision will not affect the base Building, structural components of the Building or any Building Systems (in which case Landlord shall make the final decision). Any changes to the TI Construction Drawings following Landlord's and Tenant's approval of same requested by Tenant shall be processed as provided in Section 4 hereof.

3. **Performance of the Tenant Improvements**.

(a) **Commencement and Permitting of the Tenant Improvements.** Tenant shall commence construction of the Tenant Improvements upon obtaining and delivering to Landlord a building permit (the "**TI Permit**") authorizing the construction of the Tenant Improvements consistent with the TI Construction Drawings approved by Landlord. The cost of obtaining the TI Permit shall be payable from the T1 Fund. Landlord shall assist Tenant in obtaining the TI Permit. Prior to the commencement of the Tenant Improvements, Tenant shall deliver to Landlord a copy of any contract with Tenant's contractors (including the TI Architect), and certificates of insurance from any contractor performing any part of the Tenant Improvement evidencing industry standard commercial general liability, automotive liability, "builder's risk", and workers' compensation insurance. Tenant shall cause the general contractor to provide a certificate of insurance naming Landlord, Alexandria Real Estate Equities, Inc., and Landlord's lender (if any) as additional insureds for the general contractor's liability coverages required above.

(b) **Selection of Materials, Etc**. Where more than one type of material or structure is indicated on the TI Construction Drawings approved by Tenant and Landlord, the option will be within Tenant's reasonable discretion if the matter concerns the Tenant Improvements, and within Landlord's sole and absolute subjective discretion if the matter concerns the structural components of the Building or any Building Systems.

(c) **Tenant Liability**. During the Term of the Lease, Tenant agrees to enforce its rights under any contract Tenant enters into with the TI Architect or any contractor with respect to the Tenant Improvements and enforce any warranties thereunder with respect to correcting any deficiencies or defects in the Tenant Improvements.

(d) **Substantial Completion**. Tenant shall substantially complete or cause to be substantially completed the Tenant Improvements in a good and workmanlike manner, in accordance with the TI Permit subject, in each case, to Minor Variations and normal "punch list" items of a non-material nature which do not interfere with the use of the Premises ("**Substantial Completion**" **or** "**Substantially Complete**"). Upon Substantial Completion of the Tenant Improvements, Tenant shall require the TI Architect and the general contractor to execute and deliver, for the benefit of Tenant and Landlord, a Certificate of Substantial Completion in the form of the American Institute of Architects ("**AlA**") document G704. For purposes of this Fifth Amendment Work Letter, "**Minor Variations**" shall mean any modifications reasonably required: (i) to comply with all applicable Legal Requirements and/or to obtain or to comply with any required permit (including the TI Permit); (ii) to comport with good design, engineering, and construction practices which are not material; or (iii) to make reasonable adjustments for field deviations or conditions encountered during the construction of the Tenant Improvements.

4. **Changes**. Following the approval by Landlord of the TI Design Drawings, any changes to the Tenant Improvements desired by Tenant that would affect the Building structure or Building Systems ("**Changes**") shall be subject to the written approval of Landlord, which approval may be granted or withheld in Landlord's sole and absolute discretion. Any such Changes requested by Tenant, shall be requested and instituted in accordance with the provisions of this Section 4.

(a) **Tenant's Right to Request Changes**. If Tenant shall request Changes, Tenant shall request such Changes by notifying Landlord in writing in substantially the same form as the AIA standard change order form (a "**Change Request**"), which Change Request shall detail the nature and extent of any such Change. Such Change Request must be signed by Tenant's Representative. Landlord shall review and approve or disapprove such Change Request within 10 business days thereafter, provided that Landlord's approval shall not be unreasonably withheld, conditioned or delayed.

(b) **Implementation of Changes**. If Landlord approves such Change and Tenant deposits with Landlord any Excess TI Costs (as defined in Section 5(d) below) required in connection with such Change, Tenant may cause the approved Change to be instituted. If any TI Permit modification or change is required as a result of such Change, Tenant shall promptly provide Landlord with a copy of such TI Permit modification or change.

5. **Costs**.

(a) **Budget For Tenant Improvements**. Before the commencement of construction of the Tenant Improvements, Tenant shall obtain a detailed breakdown, by trade, of the costs incurred or that will be incurred, in connection with the design and construction of the Tenant Improvements (the "**Budget**"), and deliver a copy of the Budget to Landlord for Landlord's approval, which shall not be unreasonably withheld or delayed. The Budget shall be based upon the TI Construction Drawings approved by Landlord. The Budget shall include a payment to Landlord of administrative rent ("**Administrative Rent**") equal to 1% of the TI Allowance (as hereinafter defined) for monitoring and inspecting the construction of the Tenant Improvements, which sum shall be payable from the TI Fund, Such Administrative Rent shall include, without limitation, all out-of-pocket costs, expenses and fees incurred by or on behalf of Landlord arising from, out of, or in connection with, such monitoring of the construction of the Tenant Improvements. If the Budget is greater than the Tenant Improvement Allowance, Tenant shall deposit with Landlord the difference, in cash, prior to the commencement of construction of the Tenant Improvements, for disbursement by Landlord as described in Section 5(d).

(b) **Tenant Improvement Allowance**. Landlord shall provide to Tenant a "**Tenant Improvement Allowance**" in the maximum amount of $50.00 per rentable square foot in the Third Expansion Premises, or $429,700 in the aggregate, which is included in the Base Rent set forth in Section 5(b) of the Fifth Amendment.

The Tenant Improvement Allowance shall be disbursed in accordance with this Fifth Amendment Work Letter. Tenant shall have no right to the use or benefit (including any reduction to Base Rent) of any portion of the Tenant Improvement Allowance not required for the design and construction of (i) the Tenant Improvements described in the TI Construction Drawings approved pursuant to Section 2(d) or (ii) any Changes pursuant to Section 4. Tenant shall have no right to any portion of the Tenant Improvement Allowance that is not disbursed before the last day of the month that is 12 months after the Third Expansion Premises Commencement Date.

(c) **Costs Includable in TI Fund**. The TI Fund shall be used solely for the payment of design, permits and construction costs in connection with the construction of the Tenant Improvements, including, without limitation, the cost of electrical power and other utilities used in connection with the construction of the Tenant Improvements, the cost of preparing the TI Design Drawings and the TI Construction Drawings, all costs set forth in the Budget, including Landlord's Administrative Rent, and the cost of Changes (collectively, "**TI Costs**"). Notwithstanding anything to the contrary contained herein, the TI Fund shall not be used to purchase any furniture, personal property or other non-Building system materials or equipment, including, but not limited to, Tenant's voice or data cabling, non-ducted biological safety cabinets and other scientific equipment not incorporated into the Tenant Improvements. Notwithstanding anything to the contrary contained herein, Tenant may use a reasonable and customary portion of the Tenant Improvement Allowance, as reasonably approved by Landlord, toward the cost of purchasing and installing the Building Signs which Tenant is entitled to install pursuant to Section 38 of the Lease.

(d) **Excess TI Costs**. Landlord shall have no obligation to bear any portion of the cost of any of the Tenant Improvements except to the extent of the Tenant Improvement Allowance. If at any time and from time-to-time, the remaining TI Costs under the Budget exceed the remaining unexpended Tenant Improvement Allowance, Tenant shall deposit with Landlord, as a condition precedent to Landlord's obligation to fund the Tenant Improvement Allowance, 100% of the then current TI Cost in excess of the remaining Tenant Improvement Allowance ("**Excess TI Costs**"). If Tenant fails to deposit, or is late in depositing any Excess TI Costs with Landlord, Landlord shall have all of the rights and remedies set forth in the Lease for nonpayment of Rent (including, but not limited to, the right to interest at the Default Rate and the right to assess a late charge). For purposes of any litigation instituted with regard to such amounts, those amounts will be deemed Rent under the Lease. The Tenant Improvement Allowance and Excess TI Costs is herein referred to as the "**TI Fund**." Funds deposited by Tenant shall be the first thereafter disbursed to pay TI Costs. Notwithstanding anything to the contrary set forth in this Section 5(d), Tenant shall be fully and solely liable for TI Costs and the cost of Minor Variations in excess of the Tenant Improvement Allowance. If upon Substantial Completion of the Tenant Improvements and the payment of all sums due in connection therewith there remains any undisbursed portion of the TI Fund, Tenant shall be entitled to such undisbursed TI Fund solely to the extent of any Excess TI Costs deposit Tenant has actually made with Landlord.

(e) **Payment for TI Costs**. During the course of design and construction of the Tenant Improvements, Landlord shall reimburse Tenant for TI Costs once a month against a draw request in Landlord's standard form, containing evidence of payment of such TI Costs by Tenant and such certifications, lien waivers (including a conditional lien release for each progress payment and unconditional lien releases for the prior month's progress payments), inspection reports and other matters as Landlord reasonably and customarily obtains, to the extent of Landlord's approval thereof for payment, no later than 30 days following receipt of such draw request. Upon completion of the Tenant Improvements (and prior to any final disbursement of the TI Fund), Tenant shall deliver to Landlord: (i) sworn statements setting forth the names of all contractors and first tier subcontractors who did the work and final, unconditional lien waivers from all such contractors and first tier subcontractors; (ii) as-built plans (one copy in print format and two copies in electronic CAD format) for such Tenant Improvements; (iii) a certification of substantial completion in Form MA G704, (iv) a certificate or temporary of occupancy for the Premises (or an equivalent approval); and (v) copies of all operation and maintenance manuals and warranties affecting the Premises.

6. **Miscellaneous**.

(a) **Consents**. Whenever consent or approval of either party is required under this Fifth Amendment Work Letter, that party shall not unreasonably withhold, condition or delay such consent or approval, except as may be expressly set forth herein to the contrary.

(b) **Modification**. No modification, waiver or amendment of this Fifth Amendment Work Letter or of any of its conditions or provisions shall be binding upon Landlord or Tenant unless in writing signed by Landlord and Tenant.

(c) **No Default Funding**. In no event shall Landlord have any obligation to fund any portion of the Tenant Improvement Allowance during any period that Tenant is in Default under the Lease.

Exhibit 23.1

Consent of Independent Registered Public Accounting Firm

We consent to the reference to our firm under the caption “Experts” and to the use of our report dated March 29, 2019, in the Registration Statement (Form S-1) and related Prospectus of Adaptive Biotechnologies Corporation for the registration of its common stock.

/s/ Ernst & Young LLP

Seattle, Washington
May 30, 2019