

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

**AMENDMENT NO. 1
TO
FORM S-1
REGISTRATION STATEMENT
UNDER
THE SECURITIES ACT OF 1933**

ADAPTIVE BIOTECHNOLOGIES CORPORATION

(Exact name of registrant as specified in its charter)

Washington
(State or other jurisdiction of
incorporation or organization)

2836
(Primary Standard Industrial
Classification Code Number)

27-0907024
(I.R.S. Employer
Identification Number)

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(206) 659-0067

(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

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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
Non-accelerated filer

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	Amount to be Registered ⁽¹⁾	Proposed Maximum Offering Price per Share	Proposed Maximum Aggregate Offering Price ⁽¹⁾⁽²⁾	Amount of Registration Fee ⁽³⁾
Common Stock, \$0.0001 par value per share	14,375,000	\$17.00	\$244,375,000	\$29,619

(1) Includes 1,875,000 shares of common stock that the underwriters have the option to purchase.

(2) Estimated solely for the purpose of calculating the registration fee in accordance with Rule 457(a) of the Securities Act of 1933, as amended.

(3) The registrant previously paid a total of \$27,876 in connection with the previous filing of the registration statement. In accordance with Rule 457(a), an additional registration fee of \$1,743 is being paid with this amendment to the registration statement.

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.

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 JUNE 17, 2019

12,500,000 Shares



Common Stock

This is an initial public offering of shares of common stock of Adaptive Biotechnologies Corporation. We are offering 12,500,000 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 \$15.00 and \$17.00 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 12,500,000 shares of common stock, the underwriters have the option to purchase up to an additional 1,875,000 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.

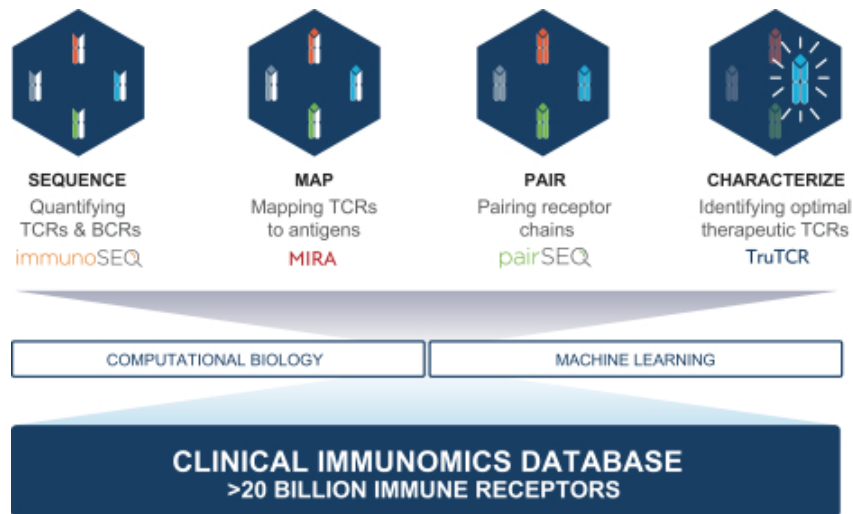
Our immune medicine platform is the foundation for our expanding suite of products and services. The cornerstone of our platform and core immunosequencing product, immunoSEQ, serves as our underlying research and development engine and generates revenue from academic and biopharmaceutical customers. 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

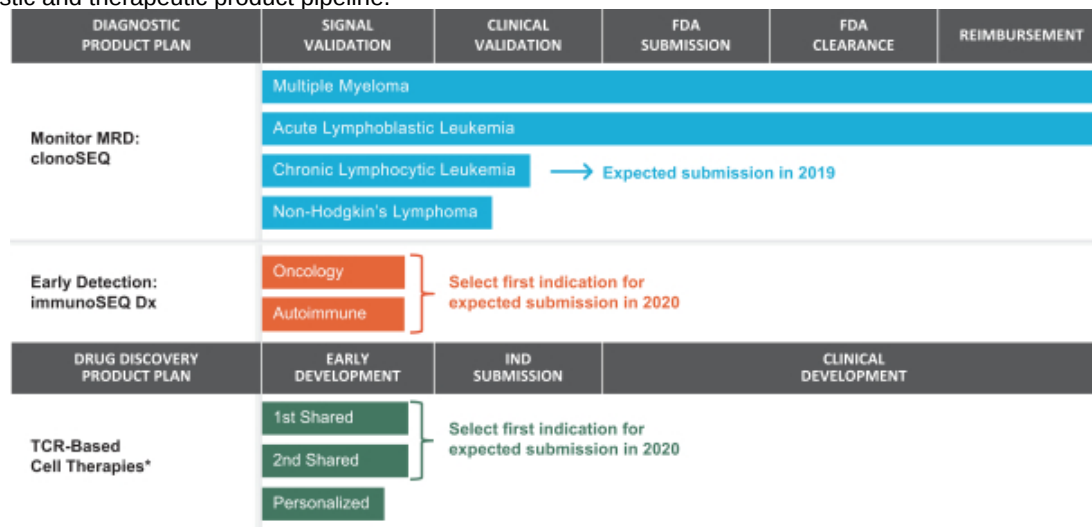
rights to over 20 billion. We believe the application of machine learning, supported by our collaboration with Microsoft, has the potential to exponentially accelerate our ability to derive novel insights from this database and use them to inform our robust product development efforts.

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 Sequentia, Inc. ("Sequentia"), a San Francisco, California-based company that was also developing an NGS test for MRD ("Sequentia 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	12,500,000 shares
Option to purchase additional shares	We have granted the underwriters an option to purchase up to 1,875,000 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	118,474,230 shares (or 120,349,230 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 \$181.8 million, or \$209.7 million if the underwriters exercise in full their option to purchase additional shares of our common stock, assuming an initial public offering price of \$16.00 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.
Directed share program	At our request, the underwriters have reserved up to 5% of the shares of common stock being offered by this prospectus for sale, at the initial public offering price, to our officers, directors and certain other persons associated with us. Shares purchased under our directed share program will be subject to the 180-day lock-up restriction described in the "Underwriting" section of this prospectus. If these persons purchase reserved shares, it will reduce the number of shares available for sale to the general public. Any reserved shares that are not so purchased will be offered by the underwriters to the general public on the same terms as the other shares offered by this prospectus. For further information regarding our directed share program, see the "Underwriting" section of this prospectus.
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 Sequentia, Inc. 2008 Stock Plan ("Sequentia Plan"), which we assumed in connection with our Sequentia Acquisition, with a weighted-average exercise price of \$0.60 per share;
- 16,841,722 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 1,740,331 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 \$7.89 per share;
- 33,699,757 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
- 1,551,917 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 1,875,000 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.

	<u>Year Ended December 31,</u>		<u>Three Months</u>	
	<u>2017</u>	<u>2018</u>	<u>2018</u>	<u>Ended March 31,</u> <u>2019</u>
	(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	<u>38,448</u>	<u>55,663</u>	<u>9,715</u>	<u>12,666</u>
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	<u>82,923</u>	<u>105,419</u>	<u>22,853</u>	<u>32,711</u>
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	<u>\$ (42,696)</u>	<u>\$ (46,345)</u>	<u>\$ (12,387)</u>	<u>\$ (18,640)</u>
Net loss per share attributable to common shareholders, basic and diluted	<u>\$ (3.50)</u>	<u>\$ (3.67)</u>	<u>\$ (1.01)</u>	<u>\$ (1.45)</u>
Weighted-average shares used in computing net loss per share attributable to common shareholders, basic and diluted	<u>12,196,998</u>	<u>12,629,778</u>	<u>12,292,563</u>	<u>12,886,087</u>
Unaudited pro forma net loss per share attributable to common shareholders, basic and diluted ⁽¹⁾		<u>\$ (0.44)</u>		<u>\$ (0.18)</u>
Unaudited weighted-average shares used in computing pro forma net loss per share attributable to common shareholders, basic and diluted		<u>105,433,645</u>		<u>105,880,665</u>
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⁾ (unaudited) (in thousands)	Pro Forma As Adjusted ⁽²⁾⁽³⁾
Balance Sheet Data:			
Cash, cash equivalents and marketable securities	\$ 440,431	\$ 440,440	\$ 622,240
Working capital ⁽⁴⁾	395,888	395,897	579,522
Total assets	614,575	614,584	794,559
Total liabilities	326,839	326,486	324,661
Convertible preferred stock	561,210	—	—
Total shareholders' (deficit) equity	(273,474)	288,098	469,898

- (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 12,500,000 shares of our common stock in this offering at an assumed initial public offering price of \$16.00 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 \$16.00 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 \$11.6 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 \$14.9 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.

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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 reagents 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;

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- 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;

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- 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;

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- 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 Sequentia 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 Européenne ("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;

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- 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.

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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 MoIDx 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

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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.

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- 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 regulations 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;

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- 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 \$13.15 per share, based on the initial public offering price of \$16.00 per share, the midpoint of the price range set forth on the cover page of this prospectus, 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 \$3.11 per share, representing an immediate increase in pro forma as adjusted net tangible book value of \$1.64 per share to our existing shareholders and an immediate dilution of \$12.89 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 118,474,230 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 or pursuant to our directed share program. 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, approximately 105,974,230 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 92,652,257 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 57.4% 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;

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- 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

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(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;

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- 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;

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- 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 \$181.8 million, or \$209.7 million if the underwriters exercise in full their option to purchase additional shares of our common stock, assuming an initial public offering price of \$16.00 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 \$16.00 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 \$11.6 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 \$14.9 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:

- \$90.0 million to \$100.0 million to fund commercial and marketing activities associated with our clinical products and services;
- \$75.0 million to \$85.0 million to fund continued research and development for our drug discovery initiatives; and
- \$40.0 million to \$50.0 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 12,500,000 shares of common stock in this offering at an assumed initial public offering price of \$16.00 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.

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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 (unaudited)	Pro Forma As Adjusted ⁽¹⁾
	(in thousands, except for share and per share amounts)		
Cash, cash equivalents and marketable securities	\$ 440,431	\$ 440,440	\$ 622,240
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; 10,000,000 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; 340,000,000 authorized, pro forma and pro forma as adjusted, 105,974,230 issued and outstanding, pro forma; 118,474,230 shares issued and outstanding, pro forma as adjusted	1	11	12
Additional paid-in capital	40,981	602,543	784,342
Accumulated other comprehensive loss	92	92	92
Accumulated deficit	(314,548)	(314,548)	(314,548)
Total shareholders' (deficit) equity	(273,474)	288,098	469,898
Total capitalization	<u>\$(288,089)</u>	<u>\$ 288,098</u>	<u>\$ 469,898</u>

- (1) Each \$1.00 increase (decrease) in the assumed initial public offering price of \$16.00 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 \$11.6 million, and our pro forma as adjusted amount of additional paid-in capital, total shareholders' (deficit) equity and total capitalization by approximately \$11.6 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 \$14.9 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.

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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 \$650.1 million, \$812.2 million, \$497.8 million, \$497.8 million and 120,349,230 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;
- 16,841,722 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 1,740,331 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 \$7.89 per share;
- 33,699,757 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
- 1,551,917 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 12,500,000 shares of common stock in this offering at an assumed initial public price of \$16.00 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 \$337.7 million, or \$2.85 per share. This amount represents an immediate increase in pro forma as adjusted net tangible book value of \$1.38 per share to our existing shareholders and an immediate dilution of \$13.15 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		\$16.00
Historical net tangible book deficit per share as of March 31, 2019	\$ (31.37)	
Pro forma increase in net tangible book value per share	<u>32.84</u>	
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	<u>1.38</u>	
Pro forma as adjusted net tangible book value per share after this offering		<u>2.85</u>
Dilution per share to new investors participating in this offering		<u>\$13.15</u>

Each \$1.00 increase (decrease) in the assumed initial public offering price of \$16.00 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 \$0.10 per share and increase (decrease) the dilution per share to new investors by \$0.10 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.

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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 \$14.9 million, or \$0.10 per share, and decrease (increase) the dilution per share to new investors participating in this offering by \$0.10 per share, assuming that the assumed initial public offering price of \$16.00, 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 \$16.00 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 \$3.04 per share, and the dilution in pro forma net tangible book value per share to investors in this offering would be approximately \$12.96 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 \$16.00 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.

	<u>Shares Purchased</u>		<u>Total Consideration</u>		<u>Average Price Per Share</u>
	<u>Number</u>	<u>Percent</u>	<u>Amount</u>	<u>Percent</u>	
Existing shareholders	105,974,230	89.4%	\$570,354,616	74.0%	\$ 5.38
Investors in this offering	12,500,000	10.6	200,000,000	26.0	16.00
Total	<u>118,474,230</u>	<u>100.0%</u>	<u>\$770,354,616</u>	<u>100.0%</u>	

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 88.1% 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 14,375,000, or 11.9% 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 \$16.00 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 \$12.5 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 \$16.0 million, assuming that the assumed initial public offering price of \$16.00, 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.

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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;
- 16,841,722 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 1,740,331 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 \$7.89 per share;
- 33,699,757 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
- 1,551,917 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 \$3.11 per share, representing an immediate increase in pro forma as adjusted net tangible book value of \$1.64 per share to our existing shareholders and an immediate dilution of \$12.89 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	
	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	<u>38,448</u>	<u>55,663</u>	<u>9,715</u>	<u>12,666</u>
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	<u>82,923</u>	<u>105,419</u>	<u>22,853</u>	<u>32,711</u>
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	<u>\$ (42,696)</u>	<u>\$ (46,345)</u>	<u>\$ (12,387)</u>	<u>\$ (18,640)</u>
Net loss per share attributable to common shareholders, basic and diluted	<u>\$ (3.50)</u>	<u>\$ (3.67)</u>	<u>\$ (1.01)</u>	<u>\$ (1.45)</u>
Weighted-average shares used in computing net loss per share attributable to common shareholders, basic and diluted	<u>12,196,998</u>	<u>12,629,778</u>	<u>12,292,563</u>	<u>12,886,087</u>
Unaudited pro forma net loss per share attributable to common shareholders, basic and diluted ⁽¹⁾		<u>\$ (0.44)</u>		<u>\$ (0.18)</u>
Unaudited weighted-average shares used in computing pro forma net loss per share attributable to common shareholders, basic and diluted ⁽¹⁾		<u>105,433,645</u>		<u>105,880,665</u>
Other Financial and Operating Data (unaudited):				
Adjusted EBITDA ⁽²⁾	<u>\$ (30,830)</u>	<u>\$ (32,607)</u>	<u>\$ (8,585)</u>	<u>\$ (15,216)</u>

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- (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
	(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
	(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	<u>\$ (42,696)</u>	<u>\$ (46,345)</u>

Revenue

<i>(in thousands, except percentages)</i>	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.

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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

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

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

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

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

<i>(in thousands)</i>	Year Ended December 31,		Change
	2017	2018	
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

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

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

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

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

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	<u>9,715</u>	<u>12,666</u>
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	<u>22,853</u>	<u>32,711</u>
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	<u><u>\$(12,387)</u></u>	<u><u>\$(18,640)</u></u>

Revenue

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

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

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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,		Change
	2018	2019	
	(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%

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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
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	\$	%
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.

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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
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.

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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.

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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.

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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		Three Months Ended	
	December 31,		March 31,	
	2017	2018	2018	2019
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.

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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.

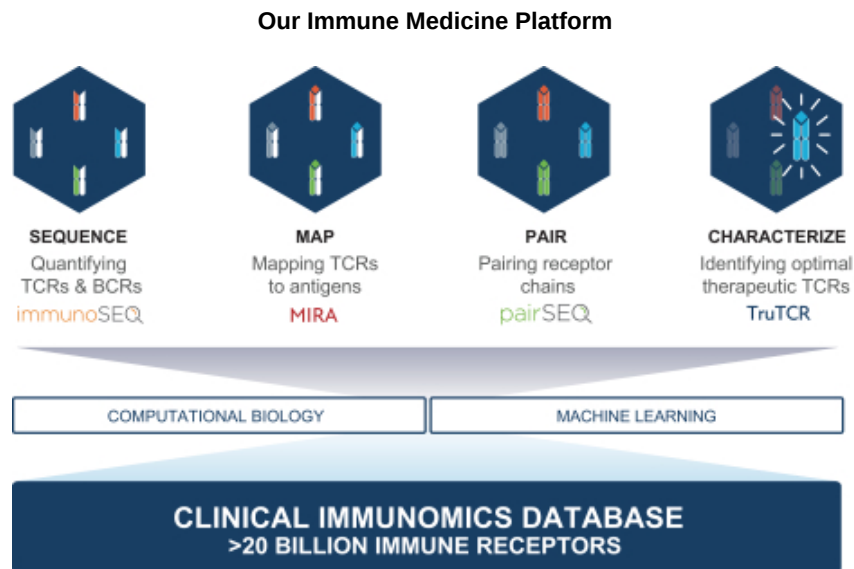
Our immune medicine platform is the foundation for our expanding suite of products and services. The cornerstone of our platform and core immunosequencing product, immunoSEQ, serves as our underlying research and development engine and generates revenue from academic and biopharmaceutical customers. 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 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

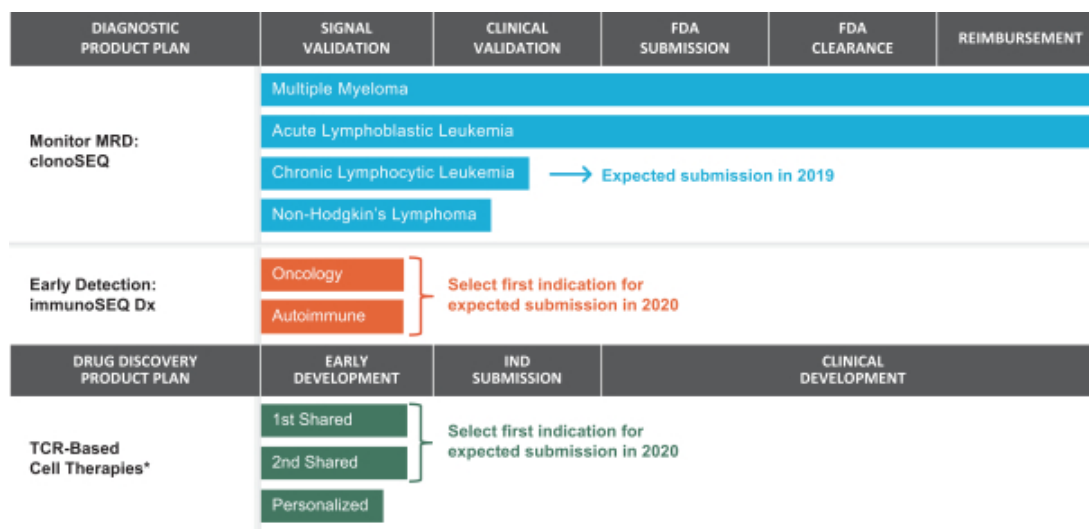
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leverage this capability for the development of cellular therapies in oncology. We are pursuing two product development pathways for novel T cell immunotherapies in which Genentech intends to use TCRs screened by our immune medicine platform to engineer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

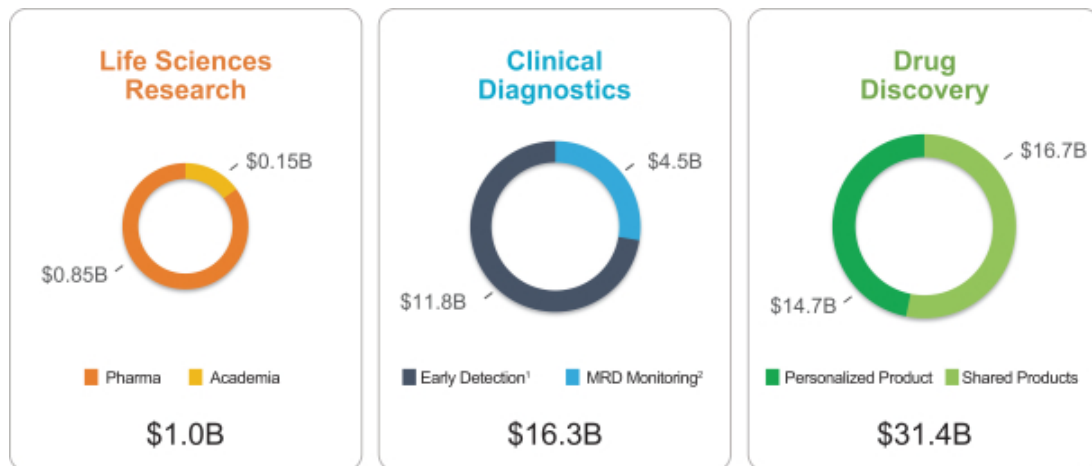
To determine the early detection opportunity for immunoSEQ Dx, while our initial indications have not yet been confirmed, we are targeting an addressable market based on two representative indications where we have developed preliminary data, celiac disease and ovarian cancer. Based on people at high 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.

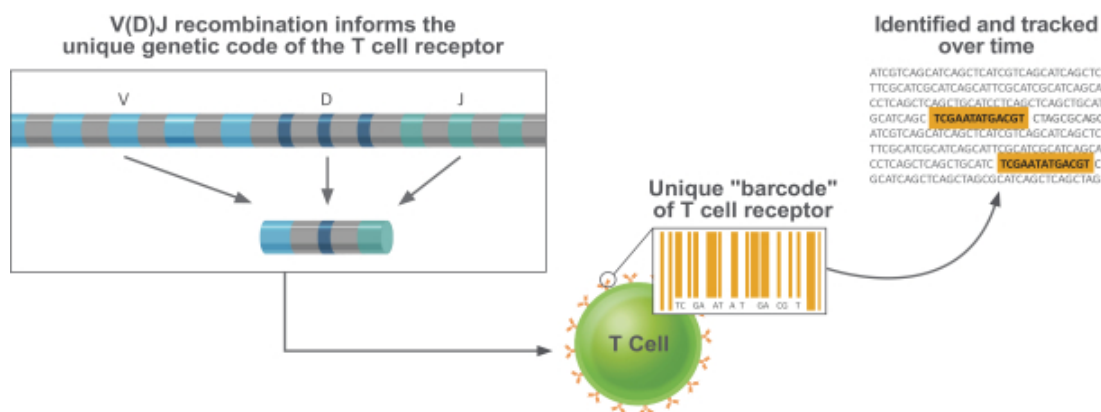
The innate and adaptive immune systems both play a role in human immunity, but only the adaptive immune system provides a specific response to signals of disease, or antigens. These disease specific antigens are primarily fragments of proteins that are recognized as foreign, such as proteins from a virus. 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 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.

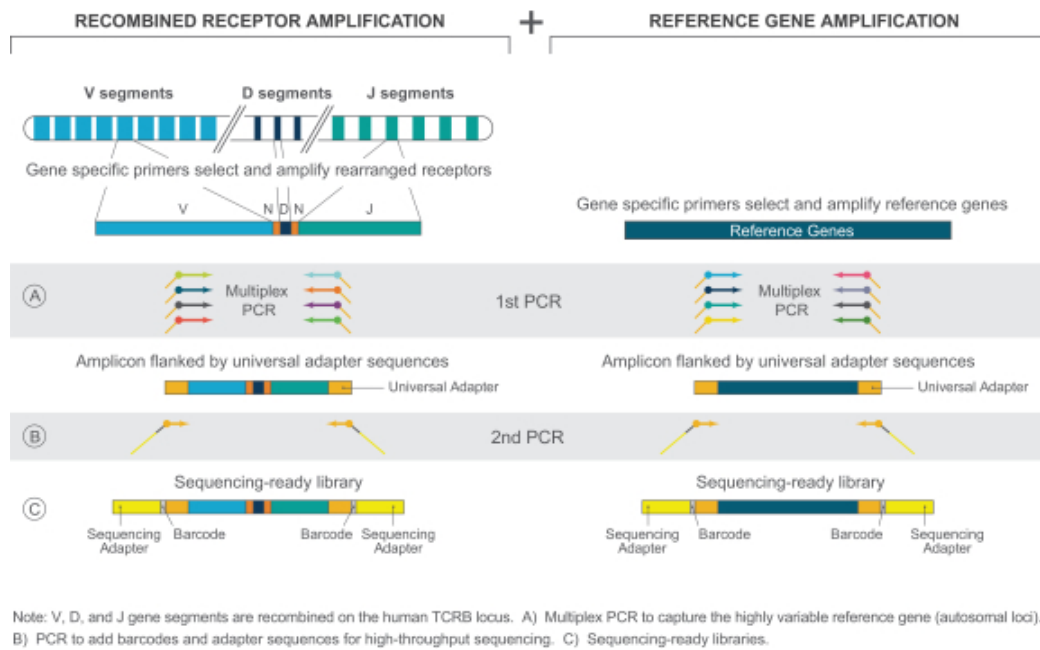
Our Immune Medicine Platform

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.



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.

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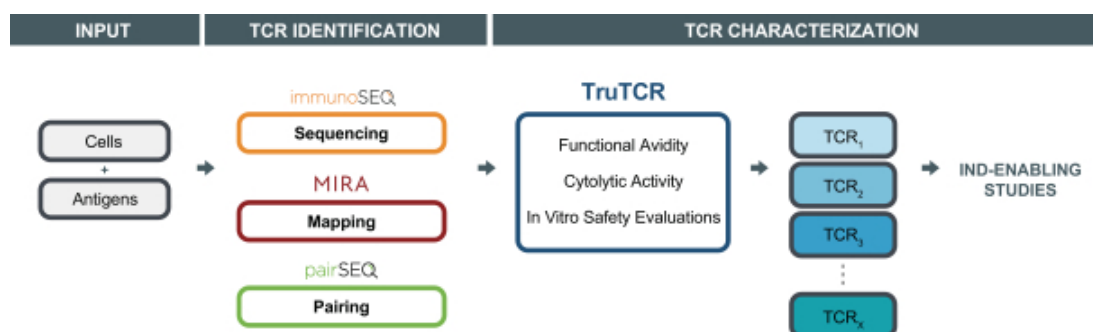
Combined with immunoSEQ, MIRA elucidates what diseases a patient's immune system has been exposed to or is actively fighting at a scale that is one thousand times more sensitive than standard immunological techniques such as ELISPOT, or enzyme-linked immunospot.

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

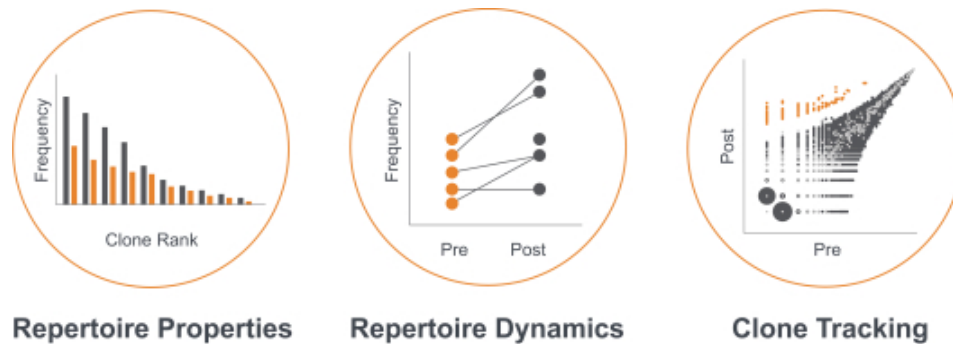
immunoSEQ for Research Use Only

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

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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. We are in active discussions with other large private payors. 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:

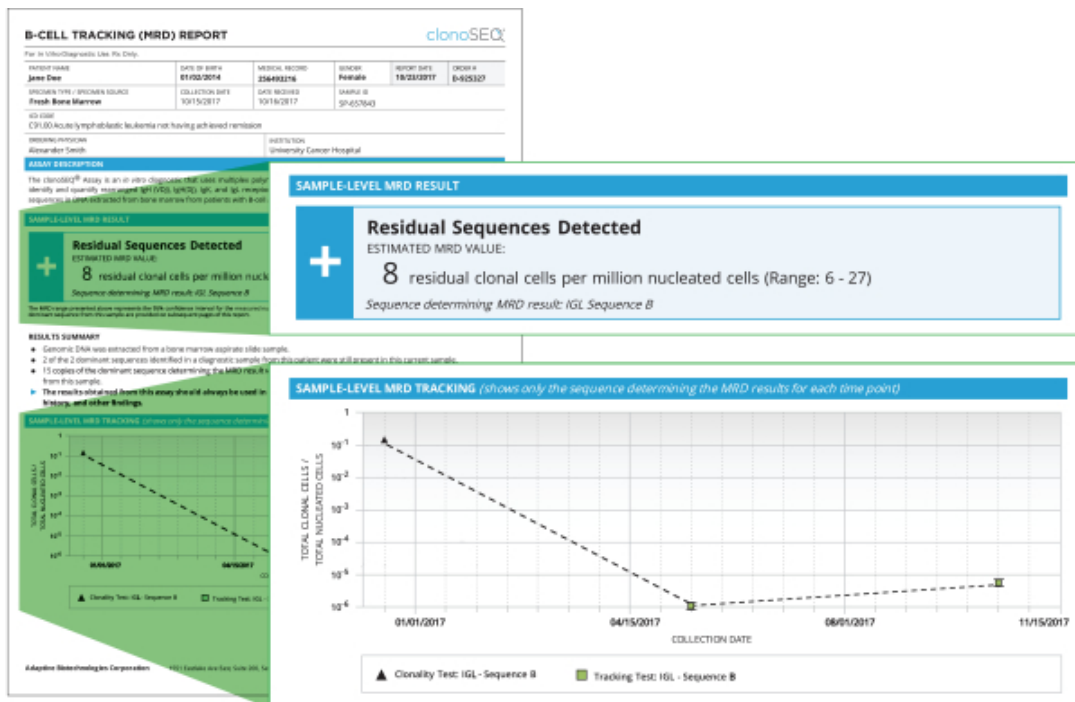
1. gDNA is extracted from bone marrow.
2. Extracted DNA quality is assessed, and rearranged immune receptors are amplified using a multiplex PCR.
3. Reaction-specific index barcode sequences for sample identification are added to the amplified receptor sequences by PCR.
4. Sequencing libraries are prepared 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.

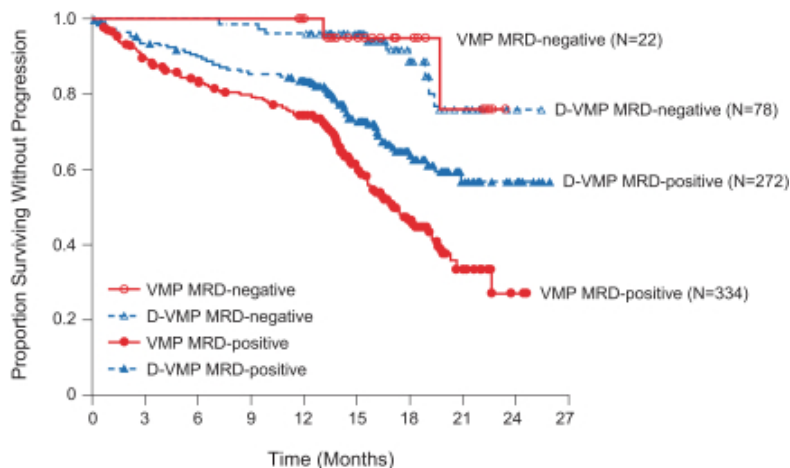
Clinical Validation in FDA Filing for MM and ALL

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.

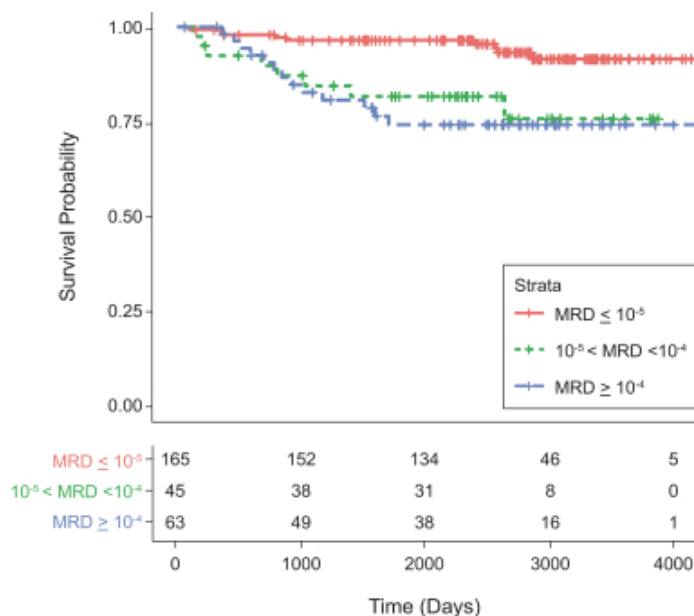
The second study, a 706 patient, randomized phase III trial sponsored by Janssen Biotech, Inc. (“ALCYONE”), evaluated Darzalex in patients with newly diagnosed MM who were transplant ineligible and served as the basis of the approval of Darzalex in combination with Bortezomib, Melphalan and Prednisone (“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.

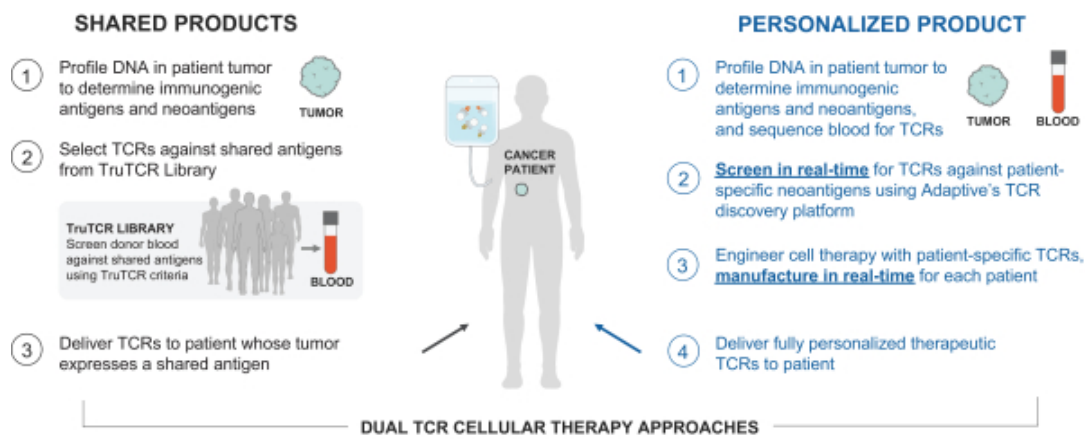
In December 2018, Genentech selected our platform to develop, manufacture and commercialize novel neoantigen directed T cell therapies for the treatment of a broad range of cancers. Our ultimate goal is to harness the vast majority of therapeutically relevant, patient-specific TCRs against neoantigens 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.

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- *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.

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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 Sequentia Acquisition in 2015, we purchased Sequentia'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 Sequentia 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 Sequentia, 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*

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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:

<u>Name</u>	<u>Age</u>	<u>Position</u>
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 also served on the board of directors of Trupanion, Inc., a public pet insurance company, including as chair of the audit committee, from December 2015 to June 2019. 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:

<u>Name</u>	<u>Age</u>	<u>Position</u>
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. ("ZS Associates"), 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 common stock by each non-employee director.

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, subject to applicable phase-in periods for committees. Under Nasdaq listing rule 5615(b)(1), a company listing in connection with its initial public offering is permitted to phase in its compliance with the independent committee requirements. We intend to rely on the phase-in schedules set forth in Nasdaq listing rule 5615(b)(1) with respect to our committees as set forth below.

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 David Goel, Robert Hershberg, PhD, MD and Andris Zoltners, PhD;
- Our Class II directors will be Eric Dobmeier, Michelle Griffin and Peter Neupert; and
- Our Class III directors will be Kevin Conroy, Michael Pellini, MD and Chad Robins.

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, Eric Dobmeier, David Goel and Michelle Griffin will serve on the audit committee, which will be chaired by Ms. Griffin. Our board of directors has determined that each member of the audit committee is "independent" as that term is defined in Nasdaq rules and has sufficient knowledge in financial and auditing matters to serve on the audit committee. In addition, our board of directors has determined that each of Mr. Dobmeier and Ms. Griffin meets the heightened independence requirements for audit committees required under Section 10A of the Exchange Act and related SEC and Nasdaq rules. Mr. Goel is not "independent" under the listing standards of Nasdaq and Rule 10A-3(b)(1) of the Exchange Act because he may be deemed to have investment and voting power over the shares of our common stock held by Matrix Fund in his capacity as the sole Managing General Partner of Matrix Capital Management, LP, and we are relying on the phase-in schedules set forth in Nasdaq listing rule 5615(b)(1) with respect to Mr. Goel's service on the audit committee. See the "*Principal Shareholders*" section of this prospectus for more information. Our board of directors has designated each member of the audit committee 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 Robert Hershberg, PhD, MD, Peter Neupert and Andris Zoltners, PhD will serve on the compensation committee, which will be chaired by Mr. Neupert. Our board of directors has determined that each member of the compensation committee is “independent” as that term is defined in Nasdaq rules and is a “non-employee director” under Rule 16b-3 under the Exchange Act. In addition, our board of directors has determined that each of Dr. Hershberg and Mr. Neupert meets the heightened independence requirements for compensation committee purposes under Section 10C of the Exchange Act and related SEC and Nasdaq rules. Dr. Zoltners is not “independent” under the listing standards of Nasdaq and Rule 10C-1(b)(1) of the Exchange Act due to transactions between us and ZS Associates, for which Dr. Zoltners currently serves as Co-Chairman, and we are relying on the phase-in schedules set forth in Nasdaq listing rule 5615(b)(1) with respect to Dr. Zoltners’ service on the compensation committee. See the “*Certain Relationships and Related Party Transactions—ZS Associates Master Services Agreement*” section of this prospectus for more information. 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 Kevin Conroy, Michael Pellini, MD and Chad Robins will serve on the nominating and corporate governance committee, which will be chaired by Mr. Robins. Our board of directors has determined that each of Mr. Conroy and Dr. Pellini is “independent” as defined in Nasdaq rules. Mr. Robins is not “independent” because he is our chief executive officer and we are relying on the phase-in schedules set forth in Nasdaq listing rule 5615(b)(1) with respect to Mr. Robins’ service on the nominating and corporate governance committee. 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.

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- (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 32,195 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 16,727 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.

Name	Grant Date	Option Awards		Option Exercise Price (\$)	Option Expiration Date
		Number of Securities Underlying Unexercised Options (#) Exercisable	Number of Securities Underlying Unexercised Options (#) Unexercisable		
Chad Robins ⁽¹⁾ CEO	12/20/2011	800,000 ⁽²⁾	—	0.33	12/20/2021
	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⁾ President	7/19/2011	100,000 ⁽⁵⁾	—	0.33	7/19/2021
	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⁾ Chief Scientific Officer	6/9/2015	600,000 ⁽³⁾	75,000	6.32	6/9/2025
	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 June 2019. It is intended to make available incentives that will assist us to attract, retain and motivate employees,

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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 15,519,170 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 18,180,587 shares 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 16,841,722 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.

Sequentia 2008 Stock Plan

In connection with our Sequentia Acquisition, we assumed our Sequentia Plan, including all awards that were then-outstanding under our Sequentia Plan. We have not granted any further awards following our assumption of our Sequentia Plan. Our Sequentia 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 Sequentia Plan and has the authority, among other things, to construe and interpret the terms of our Sequentia 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 Sequentia 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 Sequentia 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 Sequentia 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 June 2019. A total of 1,551,917 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.

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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.

Directed Share Program

At our request, the underwriters have reserved up to 5% of the shares of common stock being offered by this prospectus for sale, at the initial public offering price, to our officers, directors and certain other persons associated with us. The directed share program will not limit the ability of certain holders of more than 5% of our common stock to purchase more than \$120,000 in value of our common stock. We do not currently know the extent to which these related persons will participate in our directed share program, if at all, or to the extent they will purchase more than \$120,000 in value of our common stock.

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 (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 our common stock upon the exercise of an outstanding common stock warrant immediately prior to the closing of this offering that would otherwise expire and (iii) the issuance of 12,500,000 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. The following table does not reflect any shares of our common stock that may be purchased under our directed share program described in the "Underwriting" section of this prospectus.

<u>Name of Beneficial Owner</u>	<u>Number of Shares Beneficially Owned Prior to Offering</u>	<u>Percentage of Shares Beneficially Owned</u>	
		<u>Before this Offering</u>	<u>After this Offering</u>
5% and Greater Shareholders:			
Viking Global Entities(1)	38,156,607	36.0%	32.2%
Matrix Capital Management Master Fund, LP(2)	17,332,191	16.4	14.6
Named Executive Officers and Directors:			
Chad Robins(3)	6,754,013	6.3	5.6
Julie Rubinstein(4)	1,359,583	1.3	1.1
Harlan Robins, PhD(5)	1,608,179	1.5	1.3
Eric Dobmeier(6)	86,666	*	*
David Goel(2)	17,332,191	16.4	14.6
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	3.4
All directors and executive officers as a group (15 persons)	33,752,896	30.0	27.0

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- * 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 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 16,841,722 shares of our common stock were outstanding under our 2009 Plan, of which 10,580,560 were vested and exercisable as of that date. In addition, 15,519,170 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 92,652,257 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, 118,474,230 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, and any shares purchased under our directed share program will be subject to the lock-up agreements 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, approximately 105,974,230 additional shares plus any shares sold under our directed share program will become eligible for sale in the public market, with such shares that are held by affiliates being 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 1,184,742 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

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- 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 92,652,257 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 33,699,757 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

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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:

<u>Name</u>	<u>Number of Shares</u>
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	<u>12,500,000</u>

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 1,875,000 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 1,875,000 additional shares.

<u>Per Share</u>	<u>No Exercise</u>	<u>Full Exercise</u>
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.

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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 \$4.2 million. We have agreed to reimburse the underwriters for certain of their expenses in an amount up to \$50,000.

We have agreed to indemnify the several underwriters against certain liabilities, including liabilities under the Securities Act.

At our request, the underwriters have reserved up to 5% of the shares of common stock being offered by this prospectus for sale, at the initial public offering price, to our officers, directors and certain other persons associated with us. Shares purchased under our directed share program will be subject to a 180-day lock-up restriction. If these persons purchase reserved shares, it will reduce the

number of shares available for sale to the general public. Any reserved shares that are not so purchased will be offered by the underwriters to the general public on the same terms as the other shares offered by this prospectus.

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.

Switzerland

Shares of our common stock may not be publicly offered in Switzerland and will not be listed on the SIX Swiss Exchange ("SIX") or on any other stock exchange or regulated trading facility in Switzerland. This prospectus has been prepared without regard to the disclosure standards for issuance prospectuses under art. 652a or art. 1156 of the Swiss Code of Obligations or the disclosure standards for listing prospectuses under art. 27 ff. of the SIX Listing Rules or the listing rules of any other stock exchange or regulated trading facility in Switzerland. Neither this prospectus nor any other offering or marketing material relating to shares of our common stock or this offering may be publicly distributed or otherwise made publicly available in Switzerland.

Neither this prospectus nor any other offering or marketing material relating to this offering, us or shares of our common stock have been or will be filed with or approved by any Swiss regulatory authority. In particular, this prospectus will not be filed with, and the offer of shares of our common stock will not be supervised by, the Swiss Financial Market Supervisory Authority, and the offer of shares of our common stock has not been and will not be authorized under the Swiss Federal Act on Collective Investment Schemes ("CISA"). The investor protection afforded to acquirers of interests in collective investment schemes under the CISA does not extend to acquirers of shares.

Dubai International Financial Centre

This prospectus relates to an Exempt Offer in accordance with the Offered Securities Rules of the Dubai Financial Services Authority ("DFSA"). This prospectus is intended for distribution only to persons of a type specified in the Offered Securities Rules of the DFSA. It must not be delivered to, or relied on by, any other person. The DFSA has no responsibility for reviewing or verifying any documents in connection with Exempt Offers. The DFSA has not approved this prospectus nor taken steps to verify the information set forth herein and has no responsibility for this prospectus. The shares of our common stock to which this prospectus relates may be illiquid, subject to restrictions on their resale or illiquid and subject to restrictions on their resale. Prospective purchasers of the shares offered should conduct their own due diligence on the shares of our common stock. If you do not understand the contents of this prospectus, you should consult an authorized financial advisor.

Australia

No placement document, prospectus, product disclosure statement or other disclosure document has been lodged with the Australian Securities and Investments Commission in relation to this offering. This prospectus does not constitute a prospectus, product disclosure statement or other disclosure document under the Corporations Act 2001 ("Corporations Act"), and does not purport to include the information required for a prospectus, product disclosure statement or other disclosure document under the Corporations Act.

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Any offer in Australia of shares of our common stock may only be made to persons (“Exempt Investors”) who are “sophisticated investors” (within the meaning of section 708(8) of the Corporations Act), “professional investors” (within the meaning of section 708(11) of the Corporations Act) or otherwise pursuant to one or more exemptions contained in section 708 of the Corporations Act so that it is lawful to offer the shares without disclosure to investors under Chapter 6D of the Corporations Act.

The shares applied for by Exempt Investors in Australia must not be offered for sale in Australia in the period of 12 months after the date of allotment under this offering, except in circumstances where disclosure to investors under Chapter 6D of the Corporations Act would not be required pursuant to an exemption under section 708 of the Corporations Act or otherwise or where the offer is pursuant to a disclosure document which complies with Chapter 6D of the Corporations Act. Any person acquiring shares must observe such Australian on-sale restrictions.

This prospectus contains general information only and does not take account of the investment objectives, financial situation or particular needs of any particular person. It does not contain any securities recommendations or financial product advice. Before making an investment decision, investors need to consider whether the information in this prospectus is appropriate to their needs, objectives and circumstances, and, if necessary, seek expert advice on those matters.

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 from, 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.

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ADAPTIVE BIOTECHNOLOGIES CORPORATION

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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	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	<u>205,247</u>	<u>180,718</u>
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	<u>\$ 362,489</u>	<u>\$ 332,688</u>
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	<u>21,003</u>	<u>22,800</u>
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	<u>25,772</u>	<u>29,942</u>
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	<u>(224,616)</u>	<u>(258,112)</u>
Total liabilities, convertible preferred stock and shareholders' (deficit) equity	<u>\$ 362,489</u>	<u>\$ 332,688</u>

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	<u>38,448</u>	<u>55,663</u>
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	<u>82,923</u>	<u>105,419</u>
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	<u>\$ (42,696)</u>	<u>\$ (46,345)</u>
Net loss per share attributable to common shareholders, basic and diluted	<u>\$ (3.50)</u>	<u>\$ (3.67)</u>
Weighted-average shares used in computing net loss per share attributable to common shareholders, basic and diluted	<u>12,196,998</u>	<u>12,629,778</u>
Unaudited pro forma net loss per share attributable to common shareholders, basic and diluted		<u>\$ (0.44)</u>
Unaudited weighted-average shares used in computing pro forma net loss per share attributable to common shareholders, basic and diluted		<u>105,433,645</u>

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Statements of Comprehensive Loss
(in thousands)

	<u>Year Ended December 31,</u>	
	<u>2017</u>	<u>2018</u>
Net loss	\$ (42,831)	\$ (46,447)
Change in unrealized (loss) gain on investments	(84)	59
Comprehensive loss	<u>\$ (42,915)</u>	<u>\$ (46,388)</u>

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	<u>92,656,029</u>	<u>\$561,333</u>	<u>12,208,731</u>	<u>\$ 1</u>	<u>\$ 24,972</u>	<u>\$ (166)</u>	<u>\$ (249,423)</u>	<u>\$ (224,616)</u>
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	<u>92,790,094</u>	<u>\$560,858</u>	<u>12,841,536</u>	<u>\$ 1</u>	<u>\$ 37,902</u>	<u>\$ (107)</u>	<u>\$ (295,908)</u>	<u>\$ (258,112)</u>

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Statements of Cash Flows

(in thousands)

	<u>Year Ended December 31,</u>	
	<u>2017</u>	<u>2018</u>
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	<u>(34,858)</u>	<u>(32,259)</u>
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	<u>36,432</u>	<u>736</u>
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	<u>50,034</u>	<u>1,248</u>
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	<u>\$ 85,366</u>	<u>\$ 55,091</u>
Non-cash investing and financing activities		
Purchases of equipment, included in accounts payable and accrued liabilities	<u>\$ 41</u>	<u>\$ 832</u>
Landlord-funded leasehold improvements	<u>\$ —</u>	<u>\$ 2,419</u>

The accompanying notes are an integral part of these financial statements.

**Adaptive Biotechnologies Corporation
Notes to Financial Statements**

December 31, 2018

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.

Adaptive Biotechnologies Corporation
Notes to Financial Statements

December 31, 2018

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%	*0%
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.

**Adaptive Biotechnologies Corporation
Notes to Financial Statements**

December 31, 2018

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).

**Adaptive Biotechnologies Corporation
Notes to Financial Statements**

December 31, 2018

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.

**Adaptive Biotechnologies Corporation
Notes to Financial Statements**

December 31, 2018

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.

Adaptive Biotechnologies Corporation
Notes to Financial Statements

December 31, 2018

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

**Adaptive Biotechnologies Corporation
Notes to Financial Statements**

December 31, 2018

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

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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	<u>15,689</u>	<u>22,685</u>
Total revenue	<u>\$38,448</u>	<u>\$55,663</u>

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

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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

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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			Total
	Level 1	Level 2	Level 3	
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	<u>\$68,034</u>	<u>\$127,341</u>	<u>\$ —</u>	<u>\$195,375</u>
Financial liabilities				
Convertible preferred stock warrant liability	\$ —	\$ —	\$ 342	\$ 342
Total financial liabilities	<u>\$ —</u>	<u>\$ —</u>	<u>\$ 342</u>	<u>\$ 342</u>

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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	<u>\$45,998</u>	<u>\$109,988</u>	<u>\$ —</u>	<u>\$155,986</u>
Financial liabilities				
Convertible preferred stock warrant liability	\$ —	\$ —	\$ 336	\$ 336
Total financial liabilities	<u>\$ —</u>	<u>\$ —</u>	<u>\$ 336</u>	<u>\$ 336</u>

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	<u>\$106,990</u>	<u>\$ —</u>	<u>\$ (145)</u>	<u>\$106,845</u>
Long-term marketable securities				
U.S. government and agency securities	\$ 8,926	\$ —	\$ (21)	\$ 8,905
Total long-term marketable securities	<u>\$ 8,926</u>	<u>\$ —</u>	<u>\$ (21)</u>	<u>\$ 8,905</u>
	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	<u>\$110,095</u>	<u>\$ —</u>	<u>\$ (107)</u>	<u>\$109,988</u>

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	<u>\$84,132</u>	<u>\$ (93)</u>	<u>\$8,969</u>	<u>\$ (14)</u>

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	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	<u>\$13,954</u>	<u>\$ 19,125</u>

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	<u>\$20,325</u>	<u>\$ (5,000)</u>	<u>\$15,325</u>

	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	<u>\$20,325</u>	<u>\$ (6,699)</u>	<u>\$13,626</u>

The developed technology was acquired in connection with our acquisition of Sequentia, 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	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	<u>\$1,043</u>	<u>\$2,562</u>

9. Deferred Revenue

Deferred revenue by revenue classification was as follows (in thousands):

	December 31,	
	2017	2018
Deferred sequencing revenue	\$11,747	\$11,754
Deferred development revenue	2,301	1,645
Total deferred revenue	<u>\$14,048</u>	<u>\$13,399</u>

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		<u>(10,376)</u>
Deferred revenue balance at December 31, 2018	\$	<u>13,399</u>

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	<u>\$19,924</u>

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	<u>93,762,517</u>	<u>92,790,094</u>	<u>\$560,858</u>	<u>\$ 572,866</u>

(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

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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	<u>114,887,927</u>

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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:

<u>Exercise price</u>	<u>Options outstanding</u>	<u>Weighted- average remaining contractual life (years)</u>	<u>Options exercisable</u>	<u>Aggregate intrinsic value (in thousands)</u>
\$ 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	
	<u>14,893,253</u>	6.66	<u>10,062,291</u>	\$ 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.

Sequentia, Inc. 2008 Stock Plan, as amended

In connection with our acquisition of Sequentia Inc. in January 2015, we assumed Sequentia'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:

	<u>Convertible preferred shares subject to outstanding options</u>	<u>Weighted- average exercise price per share</u>	<u>Aggregate intrinsic value (in thousands)</u>
Outstanding at December 31, 2016	<u>814,563</u>	\$ 0.56	\$ 4,814
Options granted	—	—	
Forfeited	(121,898)	0.55	
Exercised	(171,526)	0.74	
Outstanding at December 31, 2017	<u>521,139</u>	0.50	3,195
Options granted	—	—	
Forfeited	(122,397)	0.36	
Exercised	(134,065)	0.75	
Outstanding at December 31, 2018	<u>264,677</u>	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:

<u>Exercise price</u>	<u>Options outstanding</u>	<u>Weighted-average remaining contractual life (years)</u>	<u>Options exercisable</u>	<u>Aggregated intrinsic value (in thousands)</u>
\$ 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	
	<u>264,677</u>	2.94	<u>264,639</u>	\$ 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:

	<u>Year Ended December 31,</u>	
	<u>2017</u>	<u>2018</u>
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

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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):

	<u>Year Ended December 31,</u>	
	<u>2017</u>	<u>2018</u>
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	<u>\$ 7,009</u>	<u>\$ 11,149</u>

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	<u>\$ —</u>	<u>\$ —</u>	<u>\$ —</u>	<u>\$ —</u>

(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.

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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	<u>61,942</u>	<u>75,648</u>
Valuation allowance	<u>(56,679)</u>	<u>(70,722)</u>
Deferred tax assets, net of valuation allowance	<u>5,263</u>	<u>4,926</u>
Deferred tax liabilities:		
Tangible and intangible assets	<u>(5,263)</u>	<u>(4,926)</u>
Net deferred taxes	<u>\$ —</u>	<u>\$ —</u>

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 Sequentia, 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

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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 be 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:

	<u>Year ended December 31,</u>	
	<u>2017</u>	<u>2018</u>
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	<u>0.0%</u>	<u>0.0%</u>

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	<u>\$1,260</u>

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.

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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	<u>\$ (42,696)</u>	<u>\$ (46,345)</u>
Weighted-average shares used in computing net loss per share	<u>12,196,998</u>	<u>12,629,778</u>
Net loss per share attributable to common shareholders, basic and diluted	<u>\$ (3.50)</u>	<u>\$ (3.67)</u>

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	<u>101,230,264</u>	<u>107,597,400</u>

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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)

	<u>December 31,</u> <u>2018</u>	<u>March 31,</u> <u>2019</u> <u>(unaudited)</u>	<u>Pro Forma</u> <u>as of</u> <u>March 31,</u> <u>2019</u> <u>(unaudited)</u>
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	<u>180,718</u>	<u>459,139</u>	<u>459,148</u>
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	<u>\$ 332,688</u>	<u>\$ 614,575</u>	<u>\$ 614,584</u>
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	<u>22,800</u>	<u>63,251</u>	<u>63,251</u>
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	<u>29,942</u>	<u>326,839</u>	<u>326,486</u>
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	<u>(258,112)</u>	<u>(273,474)</u>	<u>288,098</u>
Total liabilities, convertible preferred stock and shareholders' (deficit) equity	<u>\$ 332,688</u>	<u>\$ 614,575</u>	<u>\$ 614,584</u>

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	<u>9,715</u>	<u>12,666</u>
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	<u>22,853</u>	<u>32,711</u>
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	<u>\$ (12,387)</u>	<u>\$ (18,640)</u>
Net loss per share attributable to common shareholders, basic and diluted	<u>\$ (1.01)</u>	<u>\$ (1.45)</u>
Weighted-average shares used in computing net loss per share attributable to common shareholders, basic and diluted	<u>12,292,563</u>	<u>12,886,087</u>
Unaudited pro forma net loss per share attributable to common shareholders, basic and diluted		<u>\$ (0.18)</u>
Unaudited weighted-average shares used in computing pro forma net loss per share attributable to common shareholders, basic and diluted		<u>105,880,665</u>

The accompanying notes are an integral part of these financial statements.

Adaptive Biotechnologies Corporation
Condensed Statements of Comprehensive Loss
(in thousands)

	<u>Three Months Ended March 31,</u>	
	<u>2018</u>	<u>2019</u>
	<u>(unaudited)</u>	<u>(unaudited)</u>
Net loss	\$ (12,391)	\$ (18,386)
Change in unrealized (loss) gain on investments	(117)	199
Comprehensive loss	<u>\$ (12,508)</u>	<u>\$ (18,187)</u>

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)	<u>92,745,734</u>	<u>\$ 561,396</u>	<u>12,301,844</u>	<u>\$ 1</u>	<u>\$ 28,620</u>	<u>\$ (283)</u>	<u>\$ (261,950)</u>	<u>\$ (233,612)</u>
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)	<u>93,023,694</u>	<u>\$ 561,210</u>	<u>12,930,536</u>	<u>\$ 1</u>	<u>\$ 40,981</u>	<u>\$ 92</u>	<u>\$ (314,548)</u>	<u>\$ (273,474)</u>
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)	<u>—</u>	<u>\$ —</u>	<u>105,974,230</u>	<u>\$ 11</u>	<u>\$ 602,543</u>	<u>\$ 92</u>	<u>\$ (314,548)</u>	<u>\$ 288,098</u>

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	<u>(6,097)</u>	<u>278,303</u>
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	<u>(36,688)</u>	<u>(222,176)</u>
Financing activities		
Proceeds from exercise of stock options	473	130
Other	(6)	(6)
Net cash provided by financing activities	<u>467</u>	<u>124</u>
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	<u>\$ 43,048</u>	<u>\$ 111,342</u>
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

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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,		December 31,	March 31,
	2018	2019	2018	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
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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.

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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 registration 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 considered 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

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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

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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

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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

Adaptive Biotechnologies Corporation
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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.

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

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			Total
	Level 1	Level 2	Level 3	
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	<u>\$ 45,998</u>	<u>\$ 109,988</u>	<u>\$ —</u>	<u>\$ 155,986</u>
Financial liabilities				
Convertible preferred stock warrant liability	\$ —	\$ —	\$ 336	\$ 336
Total financial liabilities	<u>\$ —</u>	<u>\$ —</u>	<u>\$ 336</u>	<u>\$ 336</u>

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements
March 31, 2019

	March 31, 2019			Total
	Level 1	Level 2	Level 3	
	(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	<u>\$ 66,603</u>	<u>\$368,997</u>	<u>\$ —</u>	<u>\$435,600</u>
Financial liabilities				
Convertible preferred stock warrant liability	\$ —	\$ —	\$ 353	\$ 353
Total financial liabilities	<u>\$ —</u>	<u>\$ —</u>	<u>\$ 353</u>	<u>\$ 353</u>

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			Estimated fair value
	Amortized cost	Unrealized gain	Unrealized loss	
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	<u>\$110,095</u>	<u>\$ —</u>	<u>\$ (107)</u>	<u>\$109,988</u>

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

	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	<u>\$329,058</u>	<u>\$ 126</u>	<u>\$ (34)</u>	<u>\$329,150</u>

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	<u>\$50,503</u>	<u>\$ (12)</u>	<u>\$29,448</u>	<u>\$ (22)</u>

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	<u>\$ 20,325</u>	<u>\$ (6,699)</u>	<u>\$ 13,626</u>

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements
March 31, 2019

	March 31, 2019		
	Gross Carrying Amount	Accumulated Amortization (unaudited)	Net Carrying Amount
Acquired developed technology	\$ 20,000	\$ (7,047)	\$ 12,953
Purchased intellectual property	325	(71)	254
Balance at March 31, 2019	<u>\$ 20,325</u>	<u>\$ (7,118)</u>	<u>\$ 13,207</u>

The developed technology was acquired in connection with our acquisition of Sequentia, 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	<u>\$13,207</u>

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	<u>12,695</u>	<u>52,024</u>
Non-current deferred revenue		
Sequencing	516	799
Development	188	256,655
Total non-current deferred revenue	<u>704</u>	<u>257,454</u>
Total current and non-current deferred revenue	<u>\$ 13,399</u>	<u>\$ 309,478</u>

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.

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements
March 31, 2019

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)	<u>\$309,478</u>

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	<u>\$19,017</u>

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.

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

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):

	<u>Shares authorized</u>	<u>Shares issued and outstanding</u>	<u>Amount</u>	<u>Liquidation preference</u>
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	<u>93,762,517</u>	<u>93,023,694</u>	<u>\$561,210</u>	<u>\$ 574,277</u>

(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.

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

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	16,841,722
Shares available for future stock option grants	4,790,527
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	<u>114,798,927</u>

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)	112,531	(112,531)	6.38	
Exercised (unaudited)	—	(89,000)	0.37	
Outstanding at March 31, 2019 (unaudited)	<u>4,790,527</u>	<u>16,841,722</u>	4.95	48,090

Adaptive Biotechnologies Corporation
Notes to Unaudited Condensed Financial Statements

March 31, 2019

Sequentia, Inc. 2008 Stock Plan, as amended

In connection with our acquisition of Sequentia Inc. in January 2015, we assumed Sequentia'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)	<u>31,077</u>	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
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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	<u>\$ 3,102</u>	<u>\$ 3,046</u>

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	<u>\$ (12,387)</u>	<u>\$ (18,640)</u>
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	<u>\$ (1.01)</u>	<u>\$ (1.45)</u>

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	16,053,336
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	<u>106,553,762</u>	<u>109,277,316</u>

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):

	<u>Three Months Ended</u> <u>March 31, 2019</u> (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	<u>105,880,665</u>
Pro forma net loss per share attributable to common shareholders, basic and diluted	<u>\$ (0.18)</u>

13. Subsequent Events

In April, May and June 2019, the Board of Directors granted, pursuant to our 2009 Plan, stock options to purchase 1,490,331 shares of our common stock to certain employees and 250,000 shares of our common stock to non-employee directors. All options granted during this period have a weighted-average exercise price of \$7.89 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.

12,500,000 Shares

Adaptive Biotechnologies Corporation

Common Stock



**Goldman Sachs & Co. LLC
Cowen**

J.P. Morgan

**BofA Merrill Lynch
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	\$ 29,619.00
FINRA Filing Fee	37,156.25
The Nasdaq Global Select Market Listing Fee	295,000.00
Accounting Fees and Expenses	1,350,000.00
Legal Fees and Expenses	2,000,000.00
Transfer Agent Fees	3,500.00
Printing and Engraving Expenses	450,000.00
Miscellaneous	34,724.75
Total	\$ 4,200,000.00

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

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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 June 15, 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 Sequentia 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 Sequentia Plan. During the period beginning June 15, 2016 and ending June 14, 2019, 573,800 shares of Series E-1 convertible preferred stock were issued upon the exercise of stock options pursuant to our Sequentia Plan, which will each be converted into one share of our common stock upon the closing of this offering.

During the period beginning June 15, 2016 and ending June 14, 2019, we granted stock options to purchase an aggregate of 10,977,702 shares of our common stock, with exercise prices ranging from \$6.27 to \$9.62 per share, to employees, directors and consultants pursuant to the 2009 Plan. During the period beginning June 15, 2016 and ending June 14, 2019, 1,527,393 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

<u>Exhibit No.</u>	<u>Exhibit Index</u>
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 May 28, 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

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<u>Exhibit No.</u>	<u>Exhibit Index</u>
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)

* Previously filed.

† 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 June 17, 2019.

Adaptive Biotechnologies Corporation

By: /s/ Chad Robins
Chad Robins
Chief Executive Officer

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.

<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Chad Robins</u> Chad Robins	Chief Executive Officer and Director (Principal Executive Officer)	June 17, 2019
<u>/s/ Chad Cohen</u> Chad Cohen	Chief Financial Officer (Principal Financial and Accounting Officer)	June 17, 2019
<u>*</u> Kevin Conroy	Director	June 17, 2019
<u>*</u> Eric Dobmeier	Director	June 17, 2019
<u>*</u> David Goel	Director	June 17, 2019
<u>*</u> Michelle Griffin	Director	June 17, 2019
<u>*</u> Robert Hershberg, PhD, MD	Director	June 17, 2019
<u>*</u> Peter Neupert	Director	June 17, 2019
<u>*</u> Michael Pellini, MD	Director	June 17, 2019
<u>*</u> Andris Zoltners, PhD	Director	June 17, 2019

* By: /s/ Chad Robins
Chad Robins
Attorney-in-Fact

Adaptive Biotechnologies Corporation

Common Stock

Underwriting Agreement

_____, 2019

Goldman Sachs & Co. LLC,
J.P. Morgan Securities LLC
BofA Securities, Inc.

As representatives of the several Underwriters
named in Schedule I hereto

c/o Goldman Sachs & Co. LLC
200 West Street
New York, New York 10282-2198

c/o J.P. Morgan Securities LLC
383 Madison Avenue
New York, New York 10179

c/o BofA Securities, Inc.
One Bryant Park
New York, New York 10036

Ladies and Gentlemen:

Adaptive Biotechnologies Corporation, a Washington corporation (the “Company”), proposes, subject to the terms and conditions stated in this underwriting agreement (this “Agreement”), to issue and sell to the several Underwriters named in Schedule I hereto (the “Underwriters”), for whom Goldman Sachs & Co. LLC, J.P. Morgan Securities LLC and BofA Securities, Inc. are acting as representatives (the “Representatives”), an aggregate of [●] shares (the “Firm Shares”) and, at the election of the Underwriters, up to [●] additional shares (the “Optional Shares”) of the common stock, par value \$0.0001 per share (“Stock”), of the Company (the Firm Shares and the Optional Shares that the Underwriters elect to purchase pursuant to Section 2 hereof being collectively called the “Shares”).

J.P. Morgan Securities LLC (the “Directed Share Underwriter”) has agreed to reserve a portion of the Shares to be purchased by it under this Agreement, up to [●] Shares, for sale to certain of the Company’s directors, officers, employees and business associates and other parties related to the Company (collectively, “Participants”), as set forth in the Prospectus (as defined in Section 1(a) hereof) under the heading “Underwriting” (the “Directed Share Program”). The Shares to be sold by the Directed

Share Underwriter and its affiliates pursuant to the Directed Share Program, at the direction of the Company, are referred to hereinafter as the “Directed Shares”. Any Directed Shares not orally confirmed for purchase by any Participant by the end of the business day on which this Agreement is executed will be offered to the public by the Underwriters as set forth in the Prospectus.

1. The Company represents and warrants to, and agrees with, each of the Underwriters that:

(a) A registration statement on Form S-1 (File No. 333-231838) (the “Initial Registration Statement”) in respect of the Shares has been filed with the Securities and Exchange Commission (the “Commission”); the Initial Registration Statement and any post-effective amendment thereto, each in the form heretofore delivered to the Representatives, have been declared effective by the Commission in such form; other than a registration statement, if any, increasing the size of the offering (a “Rule 462(b) Registration Statement”), filed pursuant to Rule 462(b) under the Securities Act of 1933, as amended (the “Act”), which became effective upon filing, no other document with respect to the Initial Registration Statement has been filed with the Commission; and no stop order suspending the effectiveness of the Initial Registration Statement, any post-effective amendment thereto or the Rule 462(b) Registration Statement, if any, has been issued and no proceeding for that purpose has been initiated or, to the Company’s knowledge, threatened by the Commission (any preliminary prospectus included in the Initial Registration Statement or filed with the Commission pursuant to Rule 424(a) of the rules and regulations of the Commission under the Act is hereinafter called a “Preliminary Prospectus”; the various parts of the Initial Registration Statement and the Rule 462(b) Registration Statement, if any, including all exhibits thereto and including the information contained in the form of final prospectus filed with the Commission pursuant to Rule 424(b) under the Act in accordance with Section 5(a) hereof and deemed by virtue of Rule 430A under the Act to be part of the Initial Registration Statement at the time it was declared effective, each as amended at the time such part of the Initial Registration Statement became effective or such part of the Rule 462(b) Registration Statement, if any, became or hereafter becomes effective, are hereinafter collectively called the “Registration Statement”; the Preliminary Prospectus relating to the Shares that was included in the Registration Statement immediately prior to the Applicable Time (as defined in Section 1(c) hereof) is hereinafter called the “Pricing Prospectus”; such final prospectus, in the form first filed pursuant to Rule 424(b) under the Act, is hereinafter called the “Prospectus;” any oral or written communication with potential investors undertaken in reliance on Section 5(d) of the Act is hereinafter called a “Section 5(d) Communication”; any Section 5(d) Communication that is a written communication within the meaning of Rule 405 under the Act is hereinafter called a “Section 5(d) Writing”; and any “issuer free writing prospectus” as defined in Rule 433 under the Act relating to the Shares is hereinafter called an “Issuer Free Writing Prospectus”);

(b) (A) No order preventing or suspending the use of any Preliminary Prospectus or any Issuer Free Writing Prospectus has been issued by the Commission, and (B) each Preliminary Prospectus, at the time of filing thereof, conformed in all material respects to the requirements of the Act and the rules and regulations of the Commission thereunder, and did not contain an untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary to make the

statements therein, in the light of the circumstances under which they were made, not misleading; *provided, however*, that this representation and warranty shall not apply to any statements or omissions made in reliance upon and in conformity with the Underwriter Information (as defined in Section 9(b) of this Agreement);

(c) For the purposes of this Agreement, the “Applicable Time” is ____:____ p.m. (Eastern time) on the date of this Agreement. The Pricing Prospectus, as supplemented by the information listed on Schedule II(c) hereto, taken together (collectively, the “Pricing Disclosure Package”), as of the Applicable Time, did not, and as of each Time of Delivery (as defined in Section 4(a) of this Agreement) will not, include any untrue statement of a material fact or omit to state any material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading; and each Issuer Free Writing Prospectus and each Section 5(d) Writing does not conflict with the information contained in the Registration Statement, the Pricing Prospectus or the Prospectus and each Issuer Free Writing Prospectus and each Section 5(d) Writing, as supplemented by and taken together with the Pricing Disclosure Package, as of the Applicable Time, did not, and as of each Time of Delivery will not, include any untrue statement of a material fact or omit to state any material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading; *provided, however*, that this representation and warranty shall not apply to statements or omissions made in reliance upon and in conformity with the Underwriter Information;

(d) The Registration Statement conforms, and the Prospectus and any further amendments or supplements to the Registration Statement and the Prospectus will conform, in all material respects to the requirements of the Act and the rules and regulations of the Commission thereunder and do not and will not, as of the applicable effective date as to each part of the Registration Statement, as of the applicable filing date as to the Prospectus and any amendment or supplement thereto, and as of each Time of Delivery, contain an untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary to make the statements therein not misleading; *provided, however*, that this representation and warranty shall not apply to any statements or omissions made in reliance upon and in conformity with the Underwriter Information;

(e) The Company has not, since the date of the latest audited financial statements included in the Registration Statement, the Pricing Disclosure Package and the Pricing Prospectus, (i) sustained any material loss or interference with its business from fire, explosion, flood or other calamity, whether or not covered by insurance, or from any labor dispute or court or governmental action, order or decree or (ii) entered into any transaction or agreement (whether or not in the ordinary course of business) that is material to the Company or incurred any liability or obligation, direct or contingent, that is material to the Company; and, since the respective dates as of which information is given in the Registration Statement, the Pricing Disclosure Package and the Pricing Prospectus, there has not been (x) any change in the capital stock of the Company (other than as a result of (i) the exercise, if any, of stock options or the award, if any, of stock options or restricted stock in the ordinary course of business pursuant to the Company Stock Plans (as defined below) that are described in the Registration Statement, the Pricing Disclosure Package, the Pricing Prospectus and the Prospectus or (ii) the

issuance, if any, of stock upon conversion of Company securities as described in the Registration Statement, the Pricing Disclosure Package, the Pricing Prospectus and the Prospectus) or long-term debt of the Company or (y) any Material Adverse Effect (as defined below); as used in this Agreement, "Material Adverse Effect" shall mean any material adverse change or effect, or any development involving a prospective material adverse change or effect, in or affecting (i) the business, properties, general affairs, management, financial position, stockholders' equity or results of operations of the Company, except as set forth or contemplated in the Pricing Prospectus, or (ii) the ability of the Company to perform its obligations under this Agreement, including the issuance and sale of the Shares, or to consummate the transactions contemplated in the Pricing Prospectus and the Prospectus;

(f) The Company does not own any real property and the Company has good and marketable title to all personal property owned by it, in each case free and clear of all liens, encumbrances and defects except such as are described in the Pricing Prospectus or such as do not materially affect the value of such property and do not interfere with the use made and proposed to be made of such property by the Company; and any real property and buildings held under lease by the Company are, to the Company's knowledge, held by the Company under valid, subsisting and enforceable leases with such exceptions as are not material and do not materially interfere with the use made and proposed to be made of such property and buildings by the Company;

(g) The Company has been (i) duly incorporated and is validly existing as a corporation under the laws of its jurisdiction of organization, with power and authority (corporate and other) to own and/or lease its properties and conduct its business as described in the Registration Statement, the Pricing Disclosure Package and the Pricing Prospectus, and (ii) duly qualified as a foreign corporation for the transaction of business and is in good standing (where such concept exists) under the laws of each other jurisdiction in which it owns or leases properties or conducts any business so as to require such qualification, except, in the case of this clause (ii), where the failure to be so qualified or in good standing would not, individually or in the aggregate, have a Material Adverse Effect;

(h) The Company has no subsidiaries;

(i) The Company has an authorized capitalization as set forth in the Registration Statement, the Pricing Disclosure Package and the Pricing Prospectus and all of the issued shares of capital stock of the Company have been duly and validly authorized and issued and are fully paid and non-assessable and conform in all material respects to the description of the capital stock of the Company contained in the Registration Statement, the Pricing Disclosure Package and the Prospectus;

(j) The Shares to be issued and sold by the Company to the Underwriters hereunder have been duly and validly authorized and, when issued and delivered against payment therefor as provided herein, will be duly and validly issued and fully paid and non-assessable and will conform in all material respects to the description of the Stock contained in the Registration Statement, the Pricing Disclosure Package and the Prospectus; and the issuance of the Shares is not subject to any preemptive or similar rights that have not been complied with or otherwise effectively waived;

(k) The issue and sale of the Shares and the compliance by the Company with this Agreement and the consummation of the transactions contemplated in this Agreement and the Pricing Prospectus will not conflict with or result in a breach or violation of any of the terms or provisions of, or constitute a default under, (A) any indenture, mortgage, deed of trust, loan agreement, lease or other agreement or instrument to which the Company is a party or by which the Company is bound or to which any of the property or assets of the Company is subject, (B) the articles of incorporation or bylaws (or other applicable organizational document) of the Company, or (C) any statute or any judgment, order, rule or regulation of any court or governmental agency or body having jurisdiction over the Company or any of its properties, except, in the case of clauses (A) or (C), for such defaults, breaches, or violations that would not, individually or in the aggregate, have a Material Adverse Effect; and no consent, approval, authorization, order, registration or qualification of or with any such court or governmental agency or body is required for the issue and sale of the Shares or the consummation by the Company of the transactions contemplated by this Agreement, except such as have been obtained under the Act, the approval by the Financial Industry Regulatory Authority (“FINRA”) of the underwriting terms and arrangements and such consents, approvals, authorizations, registrations or qualifications as may be required under state securities or Blue Sky laws in connection with the purchase and distribution of the Shares by the Underwriters;

(l) The Company is not (i) in violation of its articles of incorporation or bylaws (or other applicable organizational document), (ii) in violation of any statute or any judgment, order, rule or regulation of any court or governmental agency or body having jurisdiction over the Company or any of its properties, or (iii) in default in the performance or observance of any obligation, agreement, covenant or condition contained in any indenture, mortgage, deed of trust, loan agreement, lease or other agreement or instrument to which it is a party or by which it or any of its properties may be bound, except, in the case of the foregoing clauses (ii) and (iii), for such defaults as would not, individually or in the aggregate, have a Material Adverse Effect;

(m) The statements set forth in the Registration Statement, the Pricing Disclosure Package, and the Prospectus under the captions “Description of Capital Stock” and “Shares Eligible for Future Sale”, insofar as they purport to constitute a summary of the terms of the Stock, and under the captions “Material U.S. Federal Income Tax Consequences to Non-U.S. Holders” and “Underwriting”, insofar as they purport to describe the provisions of the laws and documents referred to therein, are accurate, complete and fair in all material respects;

(n) Other than as set forth in the Registration Statement, the Pricing Disclosure Package, and the Prospectus, there are no legal or governmental proceedings pending to which the Company or, to the Company’s knowledge, any officer or director of the Company, is a party or of which any property or assets of the Company or, to the Company’s knowledge, any officer or director of the Company, is the subject which, if determined adversely to the Company (or such officer or director), would individually or in the aggregate have a Material Adverse Effect; and, to the Company’s knowledge, no such proceedings are threatened or contemplated by governmental authorities or others;

(o) The Company is not and, after giving effect to the offering and sale of the Shares and the application of the proceeds thereof, will not be required to register as an “investment company”, as such term is defined in the Investment Company Act of 1940, as amended (the “Investment Company Act”);

(p) At the time of filing the Initial Registration Statement and any post-effective amendment thereto, at the earliest time thereafter that the Company or any offering participant made a bona fide offer (within the meaning of Rule 164(h)(2) under the Act) of the Shares, and at the date hereof, the Company was not and is not an “ineligible issuer,” as defined under Rule 405 under the Act;

(q) Ernst & Young LLP, who have certified certain financial statements of the Company is an independent registered public accounting firm as required by the Act and the rules and regulations of the Commission thereunder;

(r) The Company maintains a system of internal control over financial reporting (as such term is defined in Rule 13a-15(f) under the Securities Exchange Act of 1934, as amended (the “Exchange Act”)) that (i) complies with the requirements of the Exchange Act, (ii) has been designed by the Company’s principal executive officer and principal financial officer, or under their supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles and (iii) is sufficient to provide reasonable assurance that (A) transactions are executed in accordance with management’s general or specific authorization, (B) transactions are recorded as necessary to permit preparation of financial statements in conformity with generally accepted accounting principles and to maintain accountability for assets, (C) access to assets is permitted only in accordance with management’s general or specific authorization and (D) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action is taken with respect to any differences; and the Company’s internal control over financial reporting is effective and the Company is not aware of any material weaknesses in its internal control over financial reporting;

(s) Since the date of the latest audited financial statements included in the Registration Statement, the Pricing Disclosure Package, and the Prospectus, there has been no change in the Company’s internal control over financial reporting that has materially and adversely affected, or is reasonably likely to materially and adversely affect, the Company’s internal control over financial reporting;

(t) The Company maintains disclosure controls and procedures (as such term is defined in Rule 13a-15(e) under the Exchange Act) that comply with the requirements of the Exchange Act; such disclosure controls and procedures have been designed to ensure that material information relating to the Company is made known to the Company’s principal executive officer and principal financial officer by others within the Company; and such disclosure controls and procedures are effective;

(u) This Agreement has been duly authorized, executed and delivered by the Company;

(v) Neither the Company nor any director or officer of the Company, nor, to the knowledge of the Company, any agent, employee, affiliate of the Company or other person associated with or acting on behalf of the Company has (i) directly or indirectly

made, offered, promised or authorized any unlawful payment, contribution, gift, entertainment or other unlawful benefit or expense (or taken any act in furtherance thereof); (ii) made, offered, promised or authorized any direct or indirect unlawful payment; or (iii) violated or is in violation of any provision of the U.S. Foreign Corrupt Practices Act of 1977, as amended, the Bribery Act 2010 of the United Kingdom or any other applicable anti-bribery or anti-corruption law;

(w) The operations of the Company are and have been conducted at all times in compliance with the requirements of applicable anti-money laundering laws, including, but not limited to, the Bank Secrecy Act of 1970, as amended by the USA PATRIOT ACT of 2001, and the rules and regulations promulgated thereunder, and the anti-money laundering laws of the various jurisdictions in which the Company conducts business (collectively, the “Money Laundering Laws”) and no action, suit or proceeding by or before any court or governmental agency, authority or body or any arbitrator involving the Company with respect to the Money Laundering Laws is pending or, to the knowledge of the Company, threatened;

(x) Neither the Company nor any director or officer of the Company, nor, to the knowledge of the Company, any agent, employee or affiliate of the Company is currently the subject or the target of any sanctions administered or enforced by the U.S. Government, including, without limitation, the Office of Foreign Assets Control of the U.S. Department of the Treasury, or the U.S. Department of State and including, without limitation, the designation as a “specially designated national” or “blocked person,” the European Union, Her Majesty’s Treasury, the United Nations Security Council, or other relevant sanctions authority (collectively, “Sanctions”), nor is the Company located, organized or resident in a country or territory that is the subject or target of Sanctions, and the Company will not directly or indirectly use the proceeds of the offering of the Shares hereunder, or lend, contribute or otherwise make available such proceeds to any subsidiary, joint venture partner or other person or entity (i) to fund or facilitate any activities of or business with any person, or in any country or territory, that, at the time of such funding, is the subject or the target of Sanctions or (ii) in any other manner that will result in a violation by any person (including any person participating in the transaction, whether as underwriter, advisor, investor or otherwise) of Sanctions;

(y) The financial statements included in the Registration Statement, the Pricing Prospectus and the Prospectus, together with the related schedules and notes, present fairly in all material respects the financial position of the Company at the dates indicated and the statement of operations, stockholders’ equity and cash flows of the Company for the periods specified; said financial statements have been prepared in conformity with U.S. generally accepted accounting principles (“GAAP”) applied on a consistent basis throughout the periods involved. The selected financial data and the summary financial information included in the Registration Statement, the Pricing Prospectus and the Prospectus present fairly in all material respects the information shown therein and have been compiled on a basis consistent with that of the audited financial statements included therein. Except as included therein, no historical or pro forma financial statements or supporting schedules are required to be included in the Registration Statement, the Pricing Prospectus or the Prospectus under the Act or the rules and regulations promulgated thereunder;

(z) From the time of initial confidential submission of a registration statement relating to the Shares with the Commission (or, if earlier, the first date on which a Section 5(d) Communication was made) through the date hereof, the Company has been and is an “emerging growth company” as defined in Section 2(a)(19) of the Act (an “Emerging Growth Company”);

(aa) The Company owns or has obtained valid and enforceable licenses for the inventions, patent applications, patents, trademarks, trade names, service names, copyrights, trade secrets and other intellectual property described in the Registration Statement, the Pricing Disclosure Package and the Prospectus as being owned or licensed by it or which are necessary for the conduct of its business as currently conducted or planned to be conducted as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus (collectively, “Intellectual Property”). There are no third parties who have rights to any Intellectual Property other than (i) third-party licensors or (ii) third-party joint owners whose joint ownership interest has been recorded in the United States Patent & Trademark Office (“USPTO”) except for customary reversionary rights of third-party licensors. To the Company’s knowledge, the Company is not infringing or misappropriating the intellectual property rights of third parties, and the Company is the owner of the Intellectual Property purported to be owned by it, either as the sole owner or jointly owned with a third-party, and has the valid right to use such Intellectual Property free and clear of all material liens, security interests, or encumbrances. The Company is not obligated to pay a material royalty, grant a license, or provide other material consideration to any third party in connection with the Intellectual Property, except as discussed in the Registration Statement, the Pricing Disclosure Package and the Prospectus. Beyond pending appeals at the European Patent Office related to the Company’s patents EP2364368 and EP2387627, there is no other pending or, to the Company’s knowledge, threatened action, suit, proceeding or claim by others: (A) challenging the Company’s rights in or to any Intellectual Property, including a claim to inventorship of any Intellectual Property; (B) challenging the validity, patentability, enforceability or scope of any Intellectual Property; or (C) asserting that the Company infringes or otherwise violates, or would, upon the commercialization of any product or service described in the Registration Statement and the Prospectus as under development, infringe, misappropriate or violate, any patent, trademark, trade name, service name, copyright, trade secret or other proprietary rights of others. The Company has complied with the terms of each agreement pursuant to which Intellectual Property has been licensed to the Company, and all such agreements are in full force and effect;

(bb) Except as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus, all patents and patent applications owned by or licensed to the Company or under which the Company has rights have been duly and properly filed and maintained; the parties prosecuting such applications have complied with their duty of candor and disclosure to the USPTO in connection with such applications; and the Company is not aware of any information required to be disclosed to the USPTO that was not disclosed to the USPTO and which would preclude the grant of a patent in connection with any such application or would reasonably be expected to form the basis of a finding of invalidity or unenforceability with respect to any patents that have been issued with respect to such applications;

(cc) The Company and, to the Company's knowledge, its directors, officers and employees have operated and currently are in compliance in all material respects with all applicable health care laws, rules and regulations, and guidance and policies of the jurisdictions in which the Company is conducting business, including without limitation, the Federal Food and Drug and Cosmetics Act (21 U.S.C. §§ 301 et seq.), the Clinical Laboratory Improvement Amendments of 1988 (42 U.S.C. § 263a) federal Anti-kickback Statute (42 U.S.C. § 1320a-7b(b)), the Anti-Inducement Law (42 U.S.C. § 1320a-7a(a)(5)), the civil False Claims Act (31 U.S.C. §§ 3729 et seq.), the administrative False Claims Law (42 U.S.C. § 1320a-7b(a)), the Health Insurance Portability and Accountability Act of 1996 (42 U.S.C. § 1320d et seq.) ("HIPAA"), the Health Information Technology for Economic and Clinical Health Act of 2009 (the "HITECH Act"), the exclusion laws (42 U.S.C. § 1320a-7), the Medicare Program (Title XVIII of the Social Security Act), the Medicaid Program (Title XIX of the Social Security Act), and any applicable state or local laws, each as amended from time to time (the "Health Care Laws"). The Company possesses, or qualifies for applicable exemptions to, in all material respects, such valid and current registrations, listings, approvals, clearances, licenses, certificates, authorizations or permits and supplements or amendments thereto issued or required by the appropriate state, federal or foreign regulatory agencies or bodies necessary to conduct its business ("Permits") as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus, including, without limitation, all such Permits required by the United States Food and Drug Administration (the "FDA"), the United States Department of Health and Human Services, the United States Centers for Medicare & Medicaid Services, Centers for Disease Control and Prevention, the European Medicines Agency or any other state, federal or foreign agencies or bodies engaged in the regulation of medical devices, laboratory tests, drugs, biologics, or biohazardous materials (each, an "Applicable Regulatory Authority"), and the Company has not received any notice of proceedings relating to the revocation or modification of, or non-compliance with, any Permit.

(dd) The Company's products, laboratory tests and facilities are in compliance in all material respects with all applicable (i) Health Care Laws, including, without limitation, the FDA's quality system regulation at 21 CFR Part 820, and, to the extent applicable, any similar requirements of Applicable Regulatory Authorities in countries outside the United States, and all federal and state laws regarding laboratory testing safety, accuracy, or quality, and (ii) voluntary registrations, listings, approvals, clearances, licenses, certificates, accreditations, authorizations or permits held by the Company, including without limitation, accreditation by the College of American Pathologists (the "Voluntary Accreditations"). The Company has not had any facility subject to an Applicable Regulatory Authority (including FDA) shutdown or import or export prohibition, nor has the Company received any "warning letters," "untitled letters," requests to make changes to the tests or products of the Company, processes or operations, notice of inspectional observation, or similar correspondence or notice from the FDA or other Applicable Regulatory Authority, or any entity issuing a Voluntary Accreditation, alleging or asserting material noncompliance with Health Care Laws or material noncompliance with relevant requirements for Voluntary Accreditation, other than those that have been satisfactorily addressed and/or closed out with the FDA or other Applicable Regulatory Authority, or the entity issuing a Voluntary Accreditation, and, to the Company's knowledge, neither the FDA nor any other Applicable Regulatory Authority, nor any entity issuing a Voluntary Accreditation, is considering such action.

(ee) Except as described in the Registration Statement, the Pricing Disclosure Package and the Prospectus, none of the Company's product candidates which are subject to marketing clearance or approval requirements from any Applicable Regulatory Authority have received such clearance or approval. All clinical and pre-clinical studies and trials, and all validation studies, conducted by or on behalf of or sponsored by the Company with respect to the Company's product candidates, including any such studies and trials that are described in the Registration Statement and the Prospectus, or the results of which are referred to in the Registration Statement and the Prospectus, as applicable (collectively, "Company Trials"), were, and if still pending are, to the Company's knowledge, being conducted in all material respects in accordance with all applicable Health Care Laws of the Applicable Regulatory Authorities and, to the extent required, current Good Clinical Practices and Good Laboratory Practices, any investigational device exemptions, to the extent required, their protocols and any other applicable rules, regulations and policies of the jurisdiction in which such trials and studies are being conducted or were conducted; the descriptions in the Registration Statement, the Pricing Disclosure Package and the Prospectus of the results of any Company Trials are accurate and complete descriptions in all material respects and fairly present in all material respects the data derived therefrom; the Company has no knowledge of any other studies or trials not described in the Registration Statement and the Prospectus, the results of which are inconsistent with or call into question the results described or referred to in the Registration Statement and the Prospectus; the Company has not received, nor does the Company have knowledge that any of its respective collaboration partners have received, any written notices, correspondence or other communications from the Applicable Regulatory Authorities or any other governmental entity requiring or threatening the termination, material modification or suspension of Company Trials, other than ordinary course communications with the Applicable Regulatory Authorities with respect to modifications in connection with the design and implementation of such studies or trials, and, to the Company's knowledge, there are no reasonable grounds for the same. No investigational device exemption or comparable submission filed by or on behalf of the Company with the FDA has been terminated or suspended due to concerns regarding the safety or effectiveness of the investigational product. Where required by the Health Care Laws or an Applicable Regulatory Authority, the Company has obtained (or caused to be obtained) informed consent by or on behalf of each human subject who participated in a Company Trial. In using or disclosing patient information received by the Company in connection with a Company Trial, the Company has complied in all material respects with all applicable laws and regulatory rules or requirements. To the Company's knowledge, none of the Company Trials involved any investigator who has been disqualified as a clinical investigator or has been found by the FDA to have engaged in scientific misconduct;

(ff) The Company is, and at all prior times was, in compliance in all material respects with all applicable data privacy and security laws and regulations, including without limitation, as applicable, HIPAA, as amended by the HITECH Act, the European Union General Data Protection Regulation ("GDPR") (EU 2016/679), the applicable provisions of the Federal Trade Commission Act, and all other applicable laws and regulations with respect to Personal Data that have been announced as of the date

hereof as becoming effective within 12 months after the date hereof, and for which any non-compliance with same would be reasonably likely to create a material liability as soon as they take effect (collectively, the "Privacy Laws"). To ensure compliance with the Privacy Laws, the Company has in place and is in compliance with commercially reasonable policies and procedures relating to data privacy and security and the collection, storage, use, disclosure, handling, and analysis of Personal Data (the "Policies") as applicable. For the purposes of this Section 1(ff), "Personal Data" means (i) a natural person's name, street address, telephone number, e-mail address, photograph, social security number or tax identification number, driver's license number, passport number, credit card number, bank information, or customer or account number; (ii) Protected Health Information as defined by HIPAA; (iii) "personal data" as defined by GDPR; and (iv) any other piece of information that allows the identification of such natural person or permits the collection or analysis of any data related to an identified person's health or sexual orientation. The Company has since inception made all disclosures to users or customers required by applicable laws and regulatory rules or requirements, and has provided accurate notice of its Policies then in effect to its customers, employees, third party vendors and representatives as required by applicable laws and governmental regulations. None of such disclosures made or contained in any of the Policies have been materially inaccurate, misleading, deceptive or in violation of any Privacy Laws or Policies. The execution, delivery and performance of this Agreement or any other agreement referred to in this Agreement will not result in a breach of violation of any Privacy Laws or Policies. The Company further certifies that it: (i) has not received notice of any actual or potential liability under or relating to, or actual or potential violation of, any of the Privacy Laws, and has no knowledge of any event or condition that would reasonably be expected to result in any such notice; (ii) is not currently conducting or paying for, in whole or in part, any investigation, remediation, or other corrective action pursuant to any Privacy Law; or (iii) is not a party to any order, decree, or agreement that imposes any material obligation or liability under any Privacy Law;

(gg) The Company's information technology assets and equipment, computers, systems, networks, hardware, software, websites, applications, and databases (collectively, "IT Systems") are adequate for, and operate and perform as required in connection with the operation of the business of the Company as currently conducted, and free and clear of all material bugs, errors, defects, Trojan horses, time bombs, malware and other corruptants. The Company has implemented and maintained commercially reasonable controls, policies, procedures, and safeguards to maintain and protect its material confidential information and the integrity, continuous operation, redundancy and security of all IT Systems and Personal Data used in connection with its business, and there have been no breaches, violations, outages or known unauthorized uses of or known accesses to same, except for those that have been remedied without material cost or liability or the duty to notify any other person, nor any incidents under internal review or investigations relating to the same. The Company is presently in compliance in all material respects with all applicable laws or statutes and all judgments, orders, rules and regulations of any court or arbitrator or governmental or regulatory authority, internal policies and contractual obligations relating to the privacy and security of IT Systems and Personal Data and to the protection of such IT Systems and Personal Data from unauthorized use, access, misappropriation or modification;

(hh) There are no persons with registration rights or other similar rights to have any securities registered pursuant to the Registration Statement or otherwise registered by the Company under the Act except as have been validly waived or complied with in connection with the offering of the Shares;

(ii) (i) No labor disturbance by or dispute with current or former employees or officers of the Company exists or, to the Company's knowledge, is contemplated or threatened, and (ii) the Company is not aware of any existing or imminent labor disturbance by, or dispute with, the employees of any of the Company's principal suppliers, manufacturers or contractors. The Company is not a party to any collective bargaining agreement;

(jj) The Company has insurance covering its properties, operations, personnel and business, including business interruption insurance, which insurance is in amounts and insures against such losses and risks as are reasonable and is ordinary and customary for comparable companies in the same or similar businesses; and the Company (i) has not received written notice from any insurer or agent of such insurer that capital improvements or other expenditures are required or necessary to be made in order to continue such insurance and (ii) has no reason to believe that it will not be able to renew its existing insurance coverage as and when such coverage expires or to obtain similar coverage at reasonable cost from similar insurers as may be necessary to continue its business;

(kk) The Company has filed all tax returns that are required to have been filed by it through the date hereof pursuant to applicable foreign, state and local law except insofar as the failure to file such returns would not, individually or in the aggregate, reasonably be expected to have a Material Adverse Effect, and has paid all taxes due pursuant to such returns or pursuant to any assessment received by the Company, except for cases in which the failure to file or pay would not reasonably be expected to have a Material Adverse Effect and for such taxes, if any, as are being contested in good faith and as to which adequate reserves have been provided. The charges, accruals and reserves on the books of the Company in respect of any income and corporation tax liability for any years not finally determined are adequate to meet any assessments or re-assessments for additional income tax for any years not finally determined. No tax deficiency has been determined adversely to the Company which has had (nor does the Company have any written notice or knowledge of any tax deficiency which could reasonably be expected to be determined adversely to the Company and which would, individually or in the aggregate have) a Material Adverse Effect;

(ll) The Company has not taken and will not take, directly or indirectly, without giving effect to activities by the Underwriters, any action that is designed to or that has constituted or might reasonably be expected to cause or result in stabilization or manipulation of the price of the Shares;

(mm) The Company is not a party to any contract, agreement or understanding with any person (other than this Agreement) that would give rise to a valid claim against the Company or any Underwriter for a brokerage commission, finder's fee or like payment in connection with the offering and sale of the Shares;

(nn) To the Company's knowledge, no relationship, direct or indirect, exists between or among the Company, on the one hand, and the directors, officers,

shareholders, customers or suppliers of the Company, on the other, that is required by the Act to be described in the Registration Statement and the Prospectus and that is not so described in such documents; and

(oo) (i) Each employee benefit plan, within the meaning of Section 3(3) of the Employee Retirement Income Security Act of 1974, as amended (“ERISA”), for which the Company or any member of its “Controlled Group” (defined as any entity, whether or not incorporated, that is under common control with the Company within the meaning of Section 4001(a)(14) of ERISA or any entity that would be regarded as a single employer with the Company under Section 414(b), (c), (m) or (o) of the Internal Revenue Code of 1986, as amended (the “Code”)) would have any liability (each, a “Plan”) has been maintained in material compliance with its terms and the requirements of any applicable statutes, orders, rules and regulations, including but not limited to ERISA and the Code; (ii) no prohibited transaction, within the meaning of Section 406 of ERISA or Section 4975 of the Code, has occurred with respect to any Plan, excluding transactions effected pursuant to a statutory or administrative exemption; (iii) for each Plan that is subject to the funding rules of Section 412 of the Code or Section 302 of ERISA, no Plan has failed (whether or not waived), or is reasonably expected to fail, to satisfy the minimum funding standards (within the meaning of Section 302 of ERISA or Section 412 of the Code) applicable to such Plan; (iv) no Plan is, or is reasonably expected to be, in “at risk status” (within the meaning of Section 303(i) of ERISA) and no Plan that is a “multiemployer plan” within the meaning of Section 4001(a)(3) of ERISA is in “endangered status” or “critical status” (within the meaning of Sections 304 and 305 of ERISA); (v) the fair market value of the assets of each Plan exceeds the present value of all benefits accrued under such Plan (determined based on those assumptions used to fund such Plan); (vi) no “reportable event” (within the meaning of Section 4043(c) of ERISA and the regulations promulgated thereunder) has occurred or is reasonably expected to occur; (vii) each Plan that is intended to be qualified under Section 401(a) of the Code is so qualified, and nothing has occurred, whether by action or by failure to act, which would reasonably be expected to cause the loss of such qualification; (viii) neither the Company nor any member of the Controlled Group has incurred, nor reasonably expects to incur, any liability under Title IV of ERISA (other than contributions to the Plan or premiums to the Pension Benefit Guarantee Corporation, in the ordinary course and without default) in respect of a Plan (including a “multiemployer plan” within the meaning of Section 4001(a)(3) of ERISA); and (ix) none of the following events has occurred or is reasonably likely to occur: (A) a material increase in the aggregate amount of contributions required to be made to all Plans by the Company or its Controlled Group affiliates in the current fiscal year of the Company and its Controlled Group affiliates compared to the amount of such contributions made in the Company’s and its Controlled Group affiliates’ most recently completed fiscal year; or (B) a material increase in the Company and its subsidiaries’ “accumulated post-retirement benefit obligations” (within the meaning of Accounting Standards Codification Topic 715-60) compared to the amount of such obligations in the Company and its subsidiaries’ most recently completed fiscal year; and

(pp) (i) The Registration Statement, the Pricing Disclosure Package and the Prospectus, any Preliminary Prospectus and any Issuer Free Writing Prospectus comply in all material respects, and any further amendments or supplements thereto will comply in all material respects, with any applicable laws or regulations of foreign jurisdictions in which the Registration Statement, Pricing Disclosure Package, the Prospectus, any

Preliminary Prospectus, and any Issuer Free Writing Prospectus, as amended or supplemented, if applicable, are distributed in connection with the Directed Share Program, and that (ii) no authorization, approval, consent, license, order, registration or qualification of or with any government, governmental instrumentality or court, other than such as have been obtained, is necessary under the securities laws and regulations of foreign jurisdictions in which the Directed Shares are being offered. The Company has not offered, or caused the Underwriters to offer, Shares to any person pursuant to the Directed Share Program with the specific intent to unlawfully influence (i) a customer or supplier of the Company to alter the customer or supplier's level or type of business with the Company, or (ii) a trade journalist or publication to write or publish favorable information about the Company or its products.

2. Subject to the terms and conditions herein set forth, (a) the Company agrees to issue and sell to each of the Underwriters, and each of the Underwriters agrees, severally and not jointly, to purchase from the Company, at a purchase price per share of \$[●], the number of Firm Shares set forth opposite the name of such Underwriter in Schedule I hereto and (b) in the event and to the extent that the Underwriters shall exercise the election to purchase Optional Shares as provided below, the Company agrees to issue and sell to each of the Underwriters, and each of the Underwriters agrees, severally and not jointly, to purchase from the Company, at the purchase price per share set forth in clause (a) of this Section 2 (provided that the purchase price per Optional Share shall be reduced by an amount per share equal to any dividends or distributions declared by the Company and payable on the Firm Shares but not payable on the Optional Shares), that portion of the number of Optional Shares as to which such election shall have been exercised (to be adjusted by the Representatives so as to eliminate fractional shares) determined by multiplying such number of Optional Shares by a fraction, the numerator of which is the maximum number of Optional Shares which such Underwriter is entitled to purchase as set forth opposite the name of such Underwriter in Schedule I hereto and the denominator of which is the maximum number of Optional Shares that all of the Underwriters are entitled to purchase hereunder.

The Company hereby grants to the Underwriters the right to purchase at their election up to [●] Optional Shares, at the purchase price per share set forth in the paragraph above, for the sole purpose of covering sales of shares in excess of the number of Firm Shares, provided that the purchase price per Optional Share shall be reduced by an amount per share equal to any dividends or distributions declared by the Company and payable on the Firm Shares but not payable on the Optional Shares. Any such election to purchase Optional Shares may be exercised only by written notice from the Representatives to the Company, given within a period of 30 calendar days after the date of this Agreement, setting forth the aggregate number of Optional Shares to be purchased and the date on which such Optional Shares are to be delivered, as determined by the Representatives but in no event earlier than the First Time of Delivery (as defined in Section 4 hereof) or, unless the Representatives and the Company otherwise agree in writing, earlier than two or later than ten business days after the date of such notice.

3. Upon the authorization by the Representatives of the release of the Firm Shares, the several Underwriters propose to offer the Firm Shares for sale upon the terms and conditions set forth in the Pricing Prospectus and the Prospectus.

4. (a) The Shares to be purchased by each Underwriter hereunder, in definitive or book-entry form, and in such authorized denominations and registered in such names as the Representatives may request upon at least forty-eight hours' prior notice to the Company shall be delivered by or on behalf of the Company to the Representatives, through the facilities of the Depository Trust Company ("DTC"), for the account of such Underwriter, against payment by or on behalf of such Underwriter of the purchase price therefor by wire transfer of Federal (same-day) funds to the account specified by the Company to the Representatives at least forty-eight hours in advance. The time and date of such delivery and payment shall be, with respect to the Firm Shares, 9:30 a.m., New York City time, on [●], 2019 or such other time and date as the Representatives and the Company may agree upon in writing, and, with respect to the Optional Shares, 9:30 a.m., New York time, on the date specified by the Representatives in the written notice given by the Representatives of the Underwriters' election to purchase such Optional Shares, or such other time and date as the Representatives and the Company may agree upon in writing. Such time and date for delivery of the Firm Shares is herein called the "First Time of Delivery", such time and date for delivery of the Optional Shares, if not the First Time of Delivery, is herein called the "Second Time of Delivery", and each such time and date for delivery is herein called a "Time of Delivery".

(b) The documents to be delivered at each Time of Delivery by or on behalf of the parties hereto pursuant to Section 8 hereof, including the cross receipt for the Shares and any additional documents requested by the Underwriters pursuant to Section 8(m) hereof, will be delivered at the offices of Fenwick & West LLP: 1191 Second Avenue, 10th Floor, Seattle, Washington 98101 (the "Closing Location"), and the Shares will be delivered at the designated office, all at such Time of Delivery. A meeting will be held at the Closing Location at [●] p.m., New York City time, on the New York Business Day next preceding such Time of Delivery, at which meeting the final drafts of the documents to be delivered pursuant to the preceding sentence will be available for review by the parties hereto. For the purposes of this Section 4, "New York Business Day" shall mean each Monday, Tuesday, Wednesday, Thursday and Friday which is not a day on which banking institutions in New York City are generally authorized or obligated by law or executive order to close.

5. The Company agrees with each of the Underwriters:

(a) To prepare the Prospectus in a form approved by the Representatives and to file such Prospectus pursuant to Rule 424(b) under the Act not later than the Commission's close of business on the second business day following the execution and delivery of this Agreement, or, if applicable, such earlier time as may be required by Rule 430A(a)(3) under the Act; to make no further amendment or any supplement to the Registration Statement or the Prospectus prior to the last Time of Delivery which shall be disapproved by the Representatives promptly after reasonable notice thereof; to advise the Representatives, promptly after it receives notice thereof, of the time when any amendment to the Registration Statement has been filed or becomes effective or any amendment or supplement to the Prospectus has been filed and to furnish the Representatives with copies thereof; to file promptly all material required to be filed by the Company with the Commission pursuant to Rule 433(d) under the Act; to advise the Representatives, promptly after it receives notice thereof, of the issuance by the Commission of any stop order or of any order preventing or suspending the use of any

Preliminary Prospectus or other prospectus in respect of the Shares, of the suspension of the qualification of the Shares for offering or sale in any jurisdiction, of the initiation or threatening of any proceeding for any such purpose, or of any request by the Commission for the amending or supplementing of the Registration Statement or the Prospectus or for additional information; and, in the event of the issuance of any stop order or of any order preventing or suspending the use of any Preliminary Prospectus or other prospectus or suspending any such qualification, to promptly use its best efforts to obtain the withdrawal of such order;

(b) Promptly from time to time to take such action as the Representatives may reasonably request to qualify the Shares for offering and sale under the securities laws of such jurisdictions as the Representatives may request and to comply with such laws so as to permit the continuance of sales and dealings therein in such jurisdictions for as long as may be necessary to complete the distribution of the Shares, provided that in connection therewith the Company shall not be required to qualify as a foreign corporation (where not otherwise required) or to file a general consent to service of process in any jurisdiction (where not otherwise required);

(c) Prior to 10:00 a.m., New York City time, on the New York Business Day next succeeding the date of this Agreement (or such other time as may be agreed to by the Representatives and the Company) and from time to time, to furnish the Underwriters with written and electronic copies of the Prospectus in New York City in such quantities as the Representatives may reasonably request, and, if the delivery of a prospectus (or in lieu thereof, the notice referred to in Rule 173(a) under the Act) is required at any time prior to the expiration of nine months after the time of issue of the Prospectus in connection with the offering or sale of the Shares and if at such time any event shall have occurred as a result of which the Prospectus as then amended or supplemented would include an untrue statement of a material fact or omit to state any material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made when such Prospectus (or in lieu thereof, the notice referred to in Rule 173(a) under the Act) is delivered, not misleading, or, if for any other reason it shall be necessary during such same period to amend or supplement the Prospectus in order to comply with the Act, to notify the Representatives and upon your request to prepare and furnish without charge to each Underwriter and to any dealer in securities as many written and electronic copies as the Representatives may from time to time reasonably request of an amended Prospectus or a supplement to the Prospectus which will correct such statement or omission or effect such compliance; and in case any Underwriter is required to deliver a prospectus (or in lieu thereof, the notice referred to in Rule 173(a) under the Act) in connection with sales of any of the Shares at any time nine months or more after the time of issue of the Prospectus, upon your request but at the expense of such Underwriter, to prepare and deliver to such Underwriter as many written and electronic copies as the Representatives may request of an amended or supplemented Prospectus complying with Section 10(a)(3) of the Act;

(d) To make generally available to its securityholders as soon as practicable (which may be satisfied by filing with the Commission's Electronic Data Gathering, Analysis and Retrieval System ("EDGAR")), but in any event not later than sixteen months after the effective date of the Registration Statement (as defined in Rule 158(c) under the Act), an earnings statement of the Company (which need not be audited) complying with Section 11(a) of the Act and the rules and regulations of the Commission thereunder (including, at the option of the Company, Rule 158);

(e)(1) During the period beginning from the date hereof and continuing to and including the date 180 days after the date of the Prospectus (the “Company Lock-Up Period”), not to (i) offer, sell, contract to sell, pledge, grant any option to purchase, make any short sale or otherwise transfer or dispose of, directly or indirectly, or file with or confidentially submit to the Commission a registration statement under the Act relating to, any securities of the Company that are substantially similar to the Shares, including but not limited to any options or warrants to purchase shares of Stock or any securities that are convertible into or exchangeable for, or that represent the right to receive, Stock or any such substantially similar securities, (ii) enter into any swap or other agreement that transfers, in whole or in part, any of the economic consequences of ownership of the Stock or any such other securities, whether any such transaction described in clause (i) or (ii) above is to be settled by delivery of Stock or such other securities, in cash or otherwise or (iii) publicly disclose the intention to do any of the foregoing, in each case, without the prior written consent of the Representatives; provided, however, that the foregoing restrictions shall not apply to (w) the Shares to be sold hereunder, (x) any shares of Stock issued by the Company upon the conversion or exchange of convertible or exchangeable securities outstanding as of the date of this Agreement, (y) any shares of Stock or any securities or other awards convertible into, exercisable for, or that represent the right to receive shares of Stock pursuant to any stock option plan, incentive plan or stock purchase plan of the Company (collectively, the “Company Stock Plans”) described in the Registration Statement and the Prospectus and (z) the filing by the Company of any registration statement on Form S-8 (or a successor form thereto) relating to any Company Stock Plan described in the Registration Statement and the Prospectus, and provided further, that the recipient of any shares of Stock or securities issued pursuant to clauses (x) and (y) during the Lock-Up Period shall enter into an agreement in form and substance satisfactory to the Representatives;

(e)(2) If the Representatives, in their sole discretion, agree to release or waive the restrictions set forth in a lock-up letter described in Section 8(i) hereof for an officer or director of the Company and provides the Company with notice of the impending release or waiver at least three business days before the effective date of the release or waiver, the Company agrees to announce the impending release or waiver by a press release substantially in the form of Annex I hereto through a major news service at least two business days before the effective date of the release or waiver;

(e)(3) To enforce during the Company Lock-Up Period all existing agreements between the Company and any of its securityholders that prohibit the sale, transfer, assignment, pledge or hypothecation of any of the Company’s securities in connection with the Company’s initial public offering; to direct the transfer agent to place stop transfer restrictions upon any such securities of the Company that are bound by such existing “lock-up,” “market stand-off,” “holdback” or similar provisions of such agreements for the duration of the periods contemplated in such agreements; and not to release or otherwise grant any waiver of such provisions without the prior written consent of the Representatives, on behalf of the Underwriters;

(f) During a period of three years from the effective date of the Registration Statement, for so long as the Company is subject to the reporting requirements of either

Section 13 or Section 15(d) of the Exchange Act, to furnish to its shareholders as soon as practicable after the end of each fiscal year an annual report (including a balance sheet and statements of income, stockholders' equity and cash flows of the Company certified by independent public accountants) and, as soon as practicable after the end of each of the first three quarters of each fiscal year (beginning with the fiscal quarter ending after the effective date of the Registration Statement), to make available to its shareholders summary financial information of the Company for such quarter in reasonable detail, provided that no reports, documents or other information needs to be furnished pursuant to this Section 5(f) to the extent they are available on EDGAR;

(g) During a period of three years from the effective date of the Registration Statement, to furnish to the Representatives copies of all reports or other communications (financial or other) furnished to shareholders, and to deliver to the Representatives (i) as soon as they are available, copies of any reports and financial statements furnished to or filed with the Commission or any national securities exchange on which any class of securities of the Company is listed; and (ii) such additional information concerning the business and financial condition of the Company as the Representatives may from time to time reasonably request (such financial statements to be on a consolidated basis to the extent the accounts of the Company are consolidated in reports furnished to its shareholders generally or to the Commission), provided that no reports, documents or other information needs to be furnished pursuant to this Section 5(g) to the extent they are available on EDGAR;

(h) To use the net proceeds received by it from the sale of the Shares pursuant to this Agreement in the manner specified in the Pricing Prospectus under the caption "Use of Proceeds";

(i) To use its best efforts to list for quotation the Shares on the Nasdaq Global Select Market ("Nasdaq");

(j) To file with the Commission such information on Form 10-Q or Form 10-K as may be required by Rule 463 under the Act;

(k) If the Company elects to rely upon Rule 462(b), the Company shall file a Rule 462(b) Registration Statement with the Commission in compliance with Rule 462(b) by 10:00 P.M., Washington, D.C. time, on the date of this Agreement, and the Company shall at the time of filing either pay to the Commission the filing fee for the Rule 462(b) Registration Statement or give irrevocable instructions for the payment of such fee pursuant to Rule 111(b) under the Act;

(l) Upon request of any Underwriter, to furnish, or cause to be furnished, to such Underwriter an electronic version of the Company's trademarks, servicemarks and corporate logo for use on the website, if any, operated by such Underwriter for the purpose of facilitating the on-line offering of the Shares (the "License"); provided, however, that the License shall be used solely for the purpose described above, is granted without any fee and may not be assigned or transferred; and

(m) To promptly notify the Representatives if the Company ceases to be an Emerging Growth Company at any time prior to the later of (i) completion of the distribution of the Shares within the meaning of the Act and (ii) the completion of the Company Lock-Up Period referred to in Section 5(e) hereof;

(n) To deliver to the Representatives, on the date hereof, a properly completed and executed Certification Regarding Beneficial Owners of Legal Entity Customers, together with copies of identifying documentation, and the Company undertakes to provide such additional supporting documentation as the Representatives may reasonably request in connection with the verification of the foregoing certification; and

(o) To comply with all applicable securities and other laws, rules and regulations in each jurisdiction in which the Directed Shares are offered in connection with the Directed Share Program.

6. (a) The Company represents and agrees that, without the prior consent of the Representatives, it has not made and will not make any offer relating to the Shares that would constitute a “free writing prospectus” as defined in Rule 405 under the Act; each Underwriter represents and agrees that, without the prior consent of the Company and the Representatives, it has not made and will not make any offer relating to the Shares that would constitute a free writing prospectus required to be filed with the Commission; any such free writing prospectus the use of which has been consented to by the Company and the Representatives is listed on Schedule II(a) hereto;

(b) The Company has complied and will comply with the requirements of Rule 433 under the Act applicable to any Issuer Free Writing Prospectus, including timely filing with the Commission or retention where required and legending; and the Company represents that it has satisfied and agrees that it will satisfy the conditions under Rule 433 under the Act to avoid a requirement to file with the Commission any electronic road show;

(c) The Company agrees that if at any time following issuance of an Issuer Free Writing Prospectus or Section 5(d) Writing any event occurred or occurs as a result of which such Issuer Free Writing Prospectus or Section 5(d) Writing would conflict with the information in the Registration Statement, the Pricing Prospectus or the Prospectus or would include an untrue statement of a material fact or omit to state any material fact necessary in order to make the statements therein, in the light of the circumstances then prevailing, not misleading, the Company will give prompt notice thereof to the Representatives and, if requested by the Representatives, will prepare and furnish without charge to each Underwriter an Issuer Free Writing Prospectus, Section 5(d) Writing or other document which will correct such conflict, statement or omission; provided, however, that this representation and warranty shall not apply to any statements or omissions in an Issuer Free Writing Prospectus or Section 5(d) Writing prepared or authorized by it made in reliance and in conformity with the Underwriter Information;

(d) The Company represents and agrees that (i) it has not engaged in, or authorized any other person to engage in, any Section 5(d) Communications, other than Section 5(d) Communications with the prior consent of the Representatives with entities that are qualified institutional buyers as defined in Rule 144A under the Act or institutions that are accredited investors as defined in Rule 501(a) under the Act; and (ii) it has not distributed, or authorized any other person to distribute, any Section 5(d) Writings, other than those distributed with the prior consent of the Representatives that are listed on Schedule II(d) hereto; and the Company reconfirms that the Underwriters have been authorized to act on its behalf in engaging in Section 5(d) Communications; and

(e) Each Underwriter represents and agrees that any Section 5(d) Communications undertaken by it were with entities that such Underwriter reasonably believes are qualified institutional buyers as defined in Rule 144A under the Act or institutions that are accredited investors as defined in Rule 501(a) under the Act.

7. The Company covenants and agrees with the several Underwriters that the Company will pay or cause to be paid the following: (i) the fees, disbursements and expenses of the Company's counsel and accountants in connection with the registration of the Shares under the Act and all other expenses in connection with the preparation, printing, reproduction and filing of the Registration Statement, any Preliminary Prospectus, any Section 5(d) Writing, any Issuer Free Writing Prospectus and the Prospectus and amendments and supplements thereto and the mailing and delivering of copies thereof to the Underwriters and dealers; (ii) the cost of printing or producing any Agreement among Underwriters, this Agreement, the Blue Sky Memorandum, closing documents (including any compilations thereof) and any other documents in connection with the offering, purchase, sale and delivery of the Shares; (iii) all expenses in connection with the qualification of the Shares for offering and sale under state securities laws as provided in Section 5(b) hereof, including the reasonable and documented fees and disbursements of counsel for the Underwriters in connection with such qualification and in connection with the Blue Sky survey (iv) all fees and expenses in connection with listing the Shares on Nasdaq; (v) the filing fees incident to, and the reasonable and documented fees and disbursements of counsel for the Underwriters in connection with, any required review by FINRA of the terms of the sale of the Shares; (vi) the cost and charges of any transfer agent or registrar; (vii) all reasonable and documented fees and disbursements of counsel incurred by the Underwriters in connection with the Directed Share Program, and stamp duties, similar taxes or duties or other taxes, if any, incurred by the Underwriters in connection with the Directed Share Program; and (viii) all other costs and expenses incident to the performance of its obligations hereunder which are not otherwise specifically provided for in this Section; provided however, that the amounts payable by the Company pursuant to clause (iii) and for fees and disbursements of counsel for the Underwriters described in clauses (iii) and (v) shall not exceed \$50,000 in the aggregate. It is understood, however, that, (x) except as provided in this Section, and Sections 9 and 12 hereof, the Underwriters will pay all of their own costs and expenses, including the fees of their counsel, stock transfer taxes on resale of any of the Shares by them, and any advertising expenses connected with any offers they may make and all travel and lodging expenses of the Underwriters and their representatives and counsel and (y) the Underwriters and the Company shall each pay 50% of the cost of chartering all aircraft used in connection with the road show.

8. The obligations of the Underwriters hereunder, as to the Shares to be delivered at each Time of Delivery, shall be subject, in their discretion, to the condition that all representations and warranties and other statements of the Company herein are, at and as of the Applicable Time and such Time of Delivery, true and correct, the condition that the Company shall have performed all of its obligations hereunder theretofore to be performed, and the following additional conditions:

(a) The Prospectus shall have been filed with the Commission pursuant to Rule 424(b) under the Act within the applicable time period prescribed for such filing by the rules and regulations under the Act and in accordance with Section 5(a) hereof; all material required to be filed by the Company pursuant to Rule 433(d) under the Act shall have been filed with the Commission within the applicable time period prescribed for such filing by Rule 433; if the Company has elected to rely upon Rule 462(b) under the Act, the Rule 462(b) Registration Statement shall have become effective by 10:00 P.M., Washington, D.C. time, on the date of this Agreement; no stop order suspending the effectiveness of the Registration Statement or any part thereof shall have been issued and no proceeding for that purpose shall have been initiated or threatened by the Commission; no stop order suspending or preventing the use of the Pricing Prospectus, Prospectus or any Issuer Free Writing Prospectus shall have been initiated or threatened by the Commission; and all requests for additional information on the part of the Commission shall have been complied with to the reasonable satisfaction of the Representatives;

(b) Fenwick & West LLP, counsel for the Underwriters, shall have furnished to the Representative such written opinion or opinions dated such Time of Delivery, in form and substance satisfactory to the Representatives, with respect to such matters as the Representatives may reasonably request, and such counsel shall have received such papers and information as they may reasonably request to enable them to pass upon such matters;

(c) DLA Piper LLP (US), counsel for the Company, shall have furnished to the Representatives their written opinion dated such Time of Delivery, in form and substance satisfactory to the Representatives;

(d) Cooley LLP, intellectual property counsel for the Company, shall have furnished to the Representatives their written opinion, dated such Time of Delivery, in form and substance satisfactory to the Representatives;

(e) Arnold & Porter Kaye Scholer LLP, regulatory counsel for the Company, shall have furnished to the Representatives their written opinion, dated such Time of Delivery, in form and substance satisfactory to the Representatives;

(f) On the date of the Prospectus at a time prior to the execution of this Agreement, at 9:30 a.m., New York City time, on the effective date of any post-effective amendment to the Registration Statement filed subsequent to the date of this Agreement and also at each Time of Delivery, Ernst & Young LLP shall have furnished to the Representatives a letter or letters, dated the respective dates of delivery thereof, in form and substance satisfactory to the Representatives;

(g) (i) The Company shall not have sustained since the date of the latest audited financial statements included in the Pricing Prospectus any loss or interference with its business from fire, explosion, flood or other calamity, whether or not covered by insurance, or from any labor dispute or court or governmental action, order or decree, otherwise than as set forth or contemplated in the Pricing Prospectus, and (ii) since the respective dates as of which information is given in the Pricing Prospectus there shall not

have been any change in the capital stock (other than as a result of the exercise of stock options or the award of stock options or restricted stock in the ordinary course of business pursuant to the Company Stock Plans that are described in the Pricing Prospectus) or long-term debt of the Company or any change or effect, or any development involving a prospective change or effect, in or affecting (x) the business, properties, general affairs, management, financial position, stockholders' equity or results of operations of the Company, except as set forth or contemplated in the Pricing Prospectus and the Prospectus, or (y) the ability of the Company to perform its obligations under this Agreement, including the issuance and sale of the Shares, or to consummate the transactions contemplated in the Pricing Prospectus and the Prospectus, the effect of which, in any such case described in clause (i) or (ii), is in the judgment of the Representatives so material and adverse as to make it impracticable or inadvisable to proceed with the public offering or the delivery of the Shares being delivered at such Time of Delivery on the terms and in the manner contemplated in the Pricing Prospectus and the Prospectus;

(h) On or after the Applicable Time (i) no downgrading shall have occurred in the rating accorded the Company's debt securities by any "nationally recognized statistical rating organization", as that term is defined by the Commission for purposes of Rule 436(g)(2) under the Act, and (ii) no such organization shall have publicly announced that it has under surveillance or review, with possible negative implications, its rating of any of the Company's debt securities;

(i) On or after the Applicable Time there shall not have occurred any of the following: (i) a suspension or material limitation in trading in securities generally on Nasdaq; (ii) a suspension or material limitation in trading in the Company's securities on Nasdaq; (iii) a general moratorium on commercial banking activities declared by either Federal or New York State authorities or a material disruption in commercial banking or securities settlement or clearance services in the United States; (iv) the outbreak or escalation of hostilities involving the United States or the declaration by the United States of a national emergency or war or (v) the occurrence of any other calamity or crisis or any change in financial, political or economic conditions in the United States or elsewhere, if the effect of any such event specified in clause (iv) or (v) in the judgment of the Representatives makes it impracticable or inadvisable to proceed with the public offering or the delivery of the Shares being delivered at such Time of Delivery on the terms and in the manner contemplated in the Pricing Prospectus and the Prospectus;

(j) The Shares to be sold at such Time of Delivery shall have been duly listed for quotation on Nasdaq;

(k) The Company shall have obtained and delivered to the Underwriters executed copies of an agreement from each director, officer and other security holder of the Company, substantially to the effect set forth in Section 5(e) hereof in form and substance satisfactory to the Representatives;

(l) The Company shall have complied with the provisions of Section 5(c) hereof with respect to the furnishing of prospectuses on the New York Business Day next succeeding the date of this Agreement;

(m) The Company shall have furnished or caused to be furnished to the Representatives at such Time of Delivery certificates of officers of the Company satisfactory to the Representatives as to the accuracy of the representations and warranties of the Company herein at and as of such Time of Delivery, as to the performance by the Company of all of its obligations hereunder to be performed at or prior to such Time of Delivery, as to the matters set forth in subsections (a) and (e) of this Section and as to such other matters as the Representatives may reasonably request;

(n) At each Time of Delivery, the Representatives shall have received a certificate of the Secretary of the Company, as to such matters as the Representatives may reasonably request;

(o) At each Time of Delivery, the Representatives shall have received reasonably satisfactory evidence of the valid existence of the Company in the State of Washington and its good standing (where such concept exists) as a foreign entity in such other jurisdictions as the Representatives may reasonably request, in each case in writing or any standard form of telecommunication from the appropriate governmental authorities of such jurisdictions; and

(p) At each Time of Delivery, the Company shall have furnished to the Representatives such additional information, certificates, opinions or documents as the Representatives may reasonably request.

9. (a) The Company will indemnify and hold harmless each Underwriter against any losses, claims, damages or liabilities, joint or several, to which such Underwriter may become subject, under the Act or otherwise, insofar as such losses, claims, damages or liabilities (or actions in respect thereof) arise out of or are based upon an untrue statement or alleged untrue statement of a material fact contained in the Registration Statement, any Preliminary Prospectus, the Pricing Prospectus or the Prospectus, or any amendment or supplement thereto, any Issuer Free Writing Prospectus, any "roadshow" as defined in Rule 433(h) under the Act (a "roadshow"), any "issuer information" filed or required to be filed pursuant to Rule 433(d) under the Act or any Section 5(d) Writing, or arise out of or are based upon the omission or alleged omission to state therein a material fact required to be stated therein or necessary to make the statements therein not misleading, and will reimburse each Underwriter for any legal or other expenses reasonably incurred by such Underwriter in connection with investigating or defending any such action or claim as such expenses are incurred; *provided, however,* that the Company shall not be liable in any such case to the extent that any such loss, claim, damage or liability arises out of or is based upon an untrue statement or alleged untrue statement or omission or alleged omission made in the Registration Statement, any Preliminary Prospectus, the Pricing Prospectus or the Prospectus, or any amendment or supplement thereto, or any Issuer Free Writing Prospectus or any Section 5(d) Writing, in reliance upon and in conformity with the Underwriter Information.

(b) Each Underwriter will, severally and not jointly, indemnify and hold harmless the Company against any losses, claims, damages or liabilities to which the Company may become subject, under the Act or otherwise, insofar as such losses, claims, damages or liabilities (or actions in respect thereof) arise out of or are based upon an untrue statement or alleged untrue statement of a material fact contained in the Registration Statement, any Preliminary Prospectus, the Pricing Prospectus or the Prospectus, or any amendment or supplement thereto, or any Issuer Free Writing Prospectus, or any roadshow or any Section 5(d) Writing, or arise out of or are based upon the omission or alleged omission to state therein a material fact required to be stated therein or necessary to make the statements therein not misleading, in each case to the extent, but only to the extent, that such untrue statement or alleged untrue statement or omission or alleged omission was made in the Registration Statement, any Preliminary Prospectus, the Pricing Prospectus or the Prospectus, or any amendment or supplement thereto, or any Issuer Free Writing Prospectus, or any roadshow or any Section 5(d) Writing, in reliance upon and in conformity with the Underwriter Information; and will reimburse the Company for any legal or other expenses reasonably incurred by the Company in connection with investigating or defending any such action or claim as such expenses are incurred. As used in this Agreement with respect to an Underwriter and an applicable document, "Underwriter Information" shall mean the written information furnished to the Company by such Underwriter through the Representatives expressly for use therein; it being understood and agreed upon that the only such information furnished by any Underwriter consists of the following information in the Prospectus furnished on behalf of each Underwriter: the concession and reallowance figures appearing in the fifth paragraph under the caption "Underwriting", and the information contained in the ninth, tenth and eleventh paragraphs under the caption "Underwriting".

(c) Promptly after receipt by an indemnified party under subsection (a) or (b) of this Section 9 of notice of the commencement of any action, such indemnified party shall, if a claim in respect thereof is to be made against the indemnifying party under such subsection, notify the indemnifying party in writing of the commencement thereof; provided that the failure to notify the indemnifying party shall not relieve it from any liability that it may have under the preceding paragraphs of this Section 9 except to the extent that it has been materially prejudiced (through the forfeiture of substantive rights or defenses) by such failure; and provided further that the failure to notify the indemnifying party shall not relieve it from any liability that it may have to an indemnified party otherwise than under the preceding paragraphs of this Section 9. In case any such action shall be brought against any indemnified party and it shall notify the indemnifying party of the commencement thereof, the indemnifying party shall be entitled to participate therein and, to the extent that it shall wish, jointly with any other indemnifying party similarly notified, to assume the defense thereof, with counsel reasonably satisfactory to such indemnified party (who shall not, except with the consent of the indemnified party, be counsel to the indemnifying party), and, after notice from the indemnifying party to such indemnified party of its election so to assume the defense thereof, the indemnifying party shall not be liable to such indemnified party under such subsection for any legal expenses of other counsel (other than local counsel) or any other expenses, in each case subsequently incurred by such indemnified party, in connection with the defense thereof other than reasonable costs of investigation. No indemnifying party shall, without the written consent of the indemnified party, effect the settlement or compromise of, or

consent to the entry of any judgment with respect to, any pending or threatened action or claim in respect of which indemnification or contribution may be sought hereunder (whether or not the indemnified party is an actual or potential party to such action or claim) unless such settlement, compromise or judgment (i) includes an unconditional release of the indemnified party, in form and substance reasonably satisfactory to such indemnified party, from all liability arising out of such action or claim and (ii) does not include a statement as to or an admission of fault, culpability or a failure to act, by or on behalf of any indemnified party.

(d) If the indemnification provided for in this Section 9 is unavailable to or insufficient to hold harmless an indemnified party under subsection (a) or (b) above in respect of any losses, claims, damages or liabilities (or actions in respect thereof) referred to therein, then each indemnifying party shall contribute to the amount paid or payable by such indemnified party as a result of such losses, claims, damages or liabilities (or actions in respect thereof) in such proportion as is appropriate to reflect the relative benefits received by the Company on the one hand and the Underwriters on the other from the offering of the Shares. If, however, the allocation provided by the immediately preceding sentence is not permitted by applicable law, then each indemnifying party shall contribute to such amount paid or payable by such indemnified party in such proportion as is appropriate to reflect not only such relative benefits but also the relative fault of the Company on the one hand and the Underwriters on the other in connection with the statements or omissions which resulted in such losses, claims, damages or liabilities (or actions in respect thereof), as well as any other relevant equitable considerations. The relative benefits received by the Company on the one hand and the Underwriters on the other shall be deemed to be in the same proportion as the total net proceeds from the offering (before deducting expenses) received by the Company bear to the total underwriting discounts and commissions received by the Underwriters, in each case as set forth in the table on the cover page of the Prospectus. The relative fault shall be determined by reference to, among other things, whether the untrue or alleged untrue statement of a material fact or the omission or alleged omission to state a material fact relates to information supplied by the Company on the one hand or the Underwriters on the other and the parties' relative intent, knowledge, access to information and opportunity to correct or prevent such statement or omission. The Company and the Underwriters agree that it would not be just and equitable if contribution pursuant to this subsection (d) were determined by *pro rata* allocation (even if the Underwriters were treated as one entity for such purpose) or by any other method of allocation which does not take account of the equitable considerations referred to above in this subsection (d). The amount paid or payable by an indemnified party as a result of the losses, claims, damages or liabilities (or actions in respect thereof) referred to above in this subsection (d) shall be deemed to include any legal or other expenses reasonably incurred by such indemnified party in connection with investigating or defending any such action or claim. Notwithstanding the provisions of this subsection (d), no Underwriter shall be required to contribute any amount in excess of the amount by which the total price at which the Shares underwritten by it and distributed to the public were offered to the public exceeds the amount of any damages which such Underwriter has otherwise been required to pay by reason of such untrue or alleged untrue statement or omission or alleged omission. No person guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Act) shall be entitled to contribution from any person who was not

guilty of such fraudulent misrepresentation. The Underwriters' obligations in this subsection (d) to contribute are several in proportion to their respective underwriting obligations and not joint.

(e) The obligations of the Company under this Section 9 shall be in addition to any liability which the Company may otherwise have and shall extend, upon the same terms and conditions, to each employee, officer and director of each Underwriter and each person, if any, who controls any Underwriter within the meaning of the Act and each broker-dealer or other affiliate of any Underwriter; and the obligations of the Underwriters under this Section 9 shall be in addition to any liability which the respective Underwriters may otherwise have and shall extend, upon the same terms and conditions, to each officer and director of the Company (including any person who, with his or her consent, is named in the Registration Statement as about to become a director of the Company) and to each person, if any, who controls the Company within the meaning of the Act.

10. (a) The Company agrees to indemnify and hold harmless the Directed Share Underwriter, its affiliates, directors and officers and each person, if any, who controls the Directed Share Underwriter within the meaning of either Section 15 of the Securities Act or Section 20 of the Exchange Act (each, a "Directed Share Underwriter Entity") from and against any and all losses, claims, damages and liabilities (including, without limitation, any legal fees and other expenses reasonably incurred in connection with defending or investigating any such action or claim as such expenses are incurred) (i) caused by any untrue statement or alleged untrue statement of a material fact contained in any material prepared by or with the consent of the Company for distribution to Participants in connection with the Directed Share Program or caused by any omission or alleged omission to state therein a material fact necessary to make the statements therein, in light of the circumstances under which they were made, not misleading; (ii) caused by the failure of any Participant to pay for and accept delivery of Directed Shares that the Participant agreed to purchase; or (iii) related to, arising out of, or in connection with the Directed Share Program, other than losses, claims, damages or liabilities (or expenses relating thereto) that are finally judicially determined to have resulted from the bad faith or gross negligence of the Directed Share Underwriter Entities.

(b) In case any proceeding (including any governmental investigation) shall be instituted involving any Directed Share Underwriter Entity in respect of which indemnity may be sought pursuant to Section 10(a), the Directed Share Underwriter Entity seeking indemnity shall promptly notify the Company in writing and the Company, upon request of the Directed Share Underwriter Entity, shall retain counsel reasonably satisfactory to the Directed Share Underwriter Entity to represent the Directed Share Underwriter Entity and any others the Company may designate in such proceeding and shall pay the reasonable fees and disbursements of such counsel related to such proceeding. In any such proceeding, any Directed Share Underwriter Entity shall have the right to retain its own counsel, but the fees and expenses of such counsel shall be at the expense of such Directed Share Underwriter Entity unless (i) the Company and such Directed Share Underwriter Entity shall have mutually agreed to the retention of such counsel, (ii) the Company has failed within a reasonable time to retain counsel reasonably satisfactory to such Directed Share Underwriter Entity, (iii) the Directed Share Underwriter Entity shall have reasonably concluded that there may be legal defenses available to it that are different from or in addition to those available to the Company or (iv) the named parties to

any such proceeding (including any impleaded parties) include both the Company and the Directed Share Underwriter Entity and representation of both parties by the same counsel would be inappropriate due to actual or potential differing interests between them. The Company shall not, in respect of the legal expenses of the Directed Share Underwriter Entities in connection with any proceeding or related proceedings in the same jurisdiction, be liable for the fees and expenses of more than one separate firm (in addition to any local counsel) for all Directed Share Underwriter Entities. The Company shall not be liable for any settlement of any proceeding effected without its written consent, but if settled with such consent, the Company agrees to indemnify the Directed Share Underwriter Entities from and against any loss or liability by reason of such settlement. Notwithstanding the foregoing sentence, if at any time any Directed Share Underwriter Entity shall have requested the Company to reimburse such Directed Share Underwriter Entity for fees and expenses of counsel as contemplated by the second and third sentences of this paragraph, the Company agrees that it shall be liable for any settlement of any proceeding effected without its written consent if (i) such settlement is entered into more than 30 days after receipt by the Company of the aforesaid request and (ii) the Company shall not have reimbursed such Directed Share Underwriter Entity in accordance with such request prior to the date of such settlement. The Company shall not, without the prior written consent of the Directed Share Underwriter, effect any settlement of any pending or threatened proceeding in respect of which any Directed Share Underwriter Entity is or could have been a party and indemnity could have been sought hereunder by such Directed Share Underwriter Entity, unless (x) such settlement includes an unconditional release of the Directed Share Underwriter Entities from all liability on claims that are the subject matter of such proceeding and (y) does not include any statement as to or any admission of fault, culpability or a failure to act by or on behalf of the Directed Share Underwriter Entity.

(c) To the extent the indemnification provided for in this Section 10 is unavailable to a Directed Share Underwriter Entity or insufficient in respect of any losses, claims, damages or liabilities referred to therein, then the Company in lieu of indemnifying the Directed Share Underwriter Entity thereunder, shall contribute to the amount paid or payable by the Directed Share Underwriter Entity as a result of such losses, claims, damages or liabilities (or actions in respect thereof) (1) in such proportion as is appropriate to reflect the relative benefits received by the Company on the one hand and the Directed Share Underwriter Entities on the other hand from the offering of the Directed Shares or (2) if the allocation provided by Section 10(c) (1) is not permitted by applicable law, in such proportion as is appropriate to reflect not only the relative benefits referred to in Section 10(c)(1) above but also the relative fault of the Company on the one hand and of the Directed Share Underwriter Entities on the other hand in connection with any statements or omissions that resulted in such losses, claims, damages or liabilities (or actions in respect thereof), as well as any other relevant equitable considerations. The relative benefits received by the Company on the one hand and the Directed Share Underwriter Entities on the other hand in connection with the offering of the Directed Shares shall be deemed to be in the same respective proportions as the net proceeds from the offering of the Directed Shares (before deducting expenses) received by the Company and the total underwriting discounts and commissions received by the Directed Share Underwriter Entities for the Directed Shares, bear to the aggregate public offering price of the Directed Shares. If the loss, claim, damage or liability is caused by an untrue

or alleged untrue statement of material fact or the omission or alleged omission to state a material fact, the relative fault of the Company on the one hand and the Directed Share Underwriter Entities on the other hand shall be determined by reference to, among other things, whether the untrue or alleged untrue statement or the omission or alleged omission relates to information supplied by the Company or by the Directed Share Underwriter Entities and the parties' relative intent, knowledge, access to information and opportunity to correct or prevent such statement or omission.

(d) The Company and the Directed Share Underwriter Entities agree that it would be not just or equitable if contribution pursuant to Section 10(c) were determined by *pro rata* allocation (even if the Directed Share Underwriter Entities were treated as one entity for such purpose) or by any other method of allocation that does not take account of the equitable considerations referred to in Section 10(c). The amount paid or payable by the Directed Share Underwriter Entities as a result of the losses, claims, damages and liabilities (or actions in respect thereof) referred to in the immediately preceding paragraph shall be deemed to include, subject to the limitations set forth above, any legal or other expenses reasonably incurred by the Directed Share Underwriter Entities in connection with investigating or defending any such action or claim. Notwithstanding the provisions of this Section 10, no Directed Share Underwriter Entity shall be required to contribute any amount in excess of the amount by which the total price at which the Directed Shares distributed to the public were offered to the public exceeds the amount of any damages that such Directed Share Underwriter Entity has otherwise been required to pay. No person guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Securities Act) shall be entitled to contribution from any person who was not guilty of such fraudulent misrepresentation. The remedies provided for in Sections 10(a) through 10(d) are not exclusive and shall not limit any rights or remedies which may otherwise be available to any indemnified party at law or in equity.

(e) The indemnity and contribution provisions contained in Sections 10(a) through 10(d) shall remain operative and in full force and effect regardless of (i) any termination of this Agreement, (ii) any investigation made by or on behalf of any Directed Share Underwriter Entity or the Company, its officers or directors or any person controlling the Company and (iii) acceptance of and payment for any of the Directed Shares.

11. (a) If any Underwriter shall default in its obligation to purchase the Shares which it has agreed to purchase hereunder at a Time of Delivery, the Representatives may in their discretion arrange for the Representatives or another party or other parties to purchase such Shares on the terms contained herein. If within thirty-six hours after such default by any Underwriter the Representatives do not arrange for the purchase of such Shares, then the Company shall be entitled to a further period of thirty-six hours within which to procure another party or other parties satisfactory to the Representatives to purchase such Shares on such terms. In the event that, within the respective prescribed periods, the Representatives notify the Company that the Representatives have so arranged for the purchase of such Shares, or the Company notifies the Representatives that it has so arranged for the purchase of such Shares, the Representatives or the Company shall have the right to postpone such Time of Delivery for a period of not more than seven days, in order to effect whatever changes may thereby be made necessary in the Registration Statement or the Prospectus, or in any other documents or

arrangements, and the Company agrees to file promptly any amendments or supplements to the Registration Statement or the Prospectus which in the opinion of the Representatives may thereby be made necessary. The term "Underwriter" as used in this Agreement shall include any person substituted under this Section with like effect as if such person had originally been a party to this Agreement with respect to such Shares.

(b) If, after giving effect to any arrangements for the purchase of the Shares of a defaulting Underwriter or Underwriters by the Representatives and the Company as provided in subsection (a) above, the aggregate number of such Shares which remains unpurchased does not exceed one-eleventh of the aggregate number of all the Shares to be purchased at such Time of Delivery, then the Company shall have the right to require each non-defaulting Underwriter to purchase the number of shares which such Underwriter agreed to purchase hereunder at such Time of Delivery and, in addition, to require each non-defaulting Underwriter to purchase its pro rata share (based on the number of Shares which such Underwriter agreed to purchase hereunder) of the Shares of such defaulting Underwriter or Underwriters for which such arrangements have not been made; but nothing herein shall relieve a defaulting Underwriter from liability for its default.

(c) If, after giving effect to any arrangements for the purchase of the Shares of a defaulting Underwriter or Underwriters by the Representatives and the Company as provided in subsection (a) above, the aggregate number of such Shares which remains unpurchased exceeds one-eleventh of the aggregate number of all the Shares to be purchased at such Time of Delivery, or if the Company shall not exercise the right described in subsection (b) above to require non-defaulting Underwriters to purchase Shares of a defaulting Underwriter or Underwriters, then this Agreement (or, with respect to the Second Time of Delivery, the obligations of the Underwriters to purchase and of the Company to sell the Optional Shares) shall thereupon terminate, without liability on the part of any non-defaulting Underwriter or the Company, except for the expenses to be borne by the Company and the Underwriters as provided in Section 7 hereof and the indemnity and contribution agreements in Section 9 hereof; but nothing herein shall relieve a defaulting Underwriter from liability for its default.

12. The respective indemnities, agreements, representations, warranties and other statements of the Company and the several Underwriters, as set forth in this Agreement or made by or on behalf of them, respectively, pursuant to this Agreement, shall remain in full force and effect, regardless of any investigation (or any statement as to the results thereof) made by or on behalf of any Underwriter or any controlling person of any Underwriter, or the Company, or any officer or director or controlling person of the Company, and shall survive delivery of and payment for the Shares.

13. If this Agreement shall be terminated pursuant to Section 11 hereof, the Company shall not then be under any liability to any Underwriter except as provided in Sections 7 and 9 hereof; but, if for any other reason, any Shares are not delivered by or on behalf of the Company as provided herein, the Company will reimburse the Underwriters through the Representatives for all out-of-pocket expenses approved in writing by the Representatives, including fees and disbursements of counsel, reasonably incurred by the Underwriters in making preparations for the purchase, sale and delivery of the Shares not so delivered, but the Company shall then be under no further liability to any Underwriter except as provided in Sections 7 and 9 hereof.

14. In all dealings hereunder, the Representatives shall act on behalf of each of the Underwriters, and the parties hereto shall be entitled to act and rely upon any statement, request, notice or agreement on behalf of any Underwriter made or given by the Representatives.

All statements, requests, notices and agreements hereunder shall be in writing, and (A) if to the Underwriters shall be delivered or sent by mail, telex or facsimile transmission to the Representatives in care of Goldman Sachs & Co. LLC, 200 West Street, New York, New York 10282-2198, Attention: Registration Department; in care of J.P. Morgan Securities LLC, 383 Madison Avenue, New York, New York 10179, Attention: Equity Syndicate Desk; and in care of BofA Securities, Inc., One Bryant Park, New York, New York 10036, Attention: Equity Capital Markets; and (B) if to the Company shall be delivered or sent by mail, telex or facsimile transmission to the address of the Company set forth in the Registration Statement, Attention: Secretary; provided, however, that any notice to an Underwriter pursuant to Section 9(c) hereof shall be delivered or sent by mail, telex or facsimile transmission to such Underwriter at its address set forth in its Underwriters' Questionnaire, or telex constituting such Questionnaire, which address will be supplied to the Company by the Representatives upon request; provided, however, that notices under subsection 5(e)(2) shall be in writing, and if to the Underwriters shall be delivered or sent by mail, telex or facsimile transmission to the Representatives at Goldman Sachs & Co. LLC, 200 West Street, New York, New York 10282-2198, Attention: Control Room; in care of J.P. Morgan Securities LLC, 383 Madison Avenue, New York, New York 10179; and in care of BofA Securities, Inc., One Bryant Park, New York, New York 10036. Any such statements, requests, notices or agreements shall take effect upon receipt thereof.

In accordance with the requirements of the USA Patriot Act (Title III of Pub. L. 107-56 (signed into law October 26, 2001)), the Underwriters are required to obtain, verify and record information that identifies their respective clients, including the Company, which information may include the name and address of their respective clients, as well as other information that will allow the Underwriters to properly identify their respective clients.

14. This Agreement shall be binding upon, and inure solely to the benefit of, the Underwriters, the Company and, to the extent provided in Sections 9 and 12 hereof, the officers and directors of the Company and each person who controls the Company or any Underwriter, and their respective heirs, executors, administrators, successors and assigns, and no other person shall acquire or have any right under or by virtue of this Agreement. No purchaser of any of the Shares from any Underwriter shall be deemed a successor or assign by reason merely of such purchase.

15. Time shall be of the essence of this Agreement. As used herein, the term "business day" shall mean any day when the Commission's office in Washington, D.C. is open for business.

16. The Company acknowledges and agrees that (i) the purchase and sale of the Shares pursuant to this Agreement is an arm's-length commercial transaction between the Company, on the one hand, and the several Underwriters, on the other, (ii) in connection therewith and with the process leading to such transaction each Underwriter is acting solely as a principal and not the agent or fiduciary of the Company, (iii) no Underwriter has assumed an advisory or fiduciary responsibility in favor of the

Company with respect to the offering contemplated hereby or the process leading thereto (irrespective of whether such Underwriter has advised or is currently advising the Company on other matters) or any other obligation to the Company except the obligations expressly set forth in this Agreement and (iv) the Company has consulted its own legal and financial advisors to the extent it deemed appropriate. The Company agrees that it will not claim that the Underwriters, or any of them, has rendered advisory services of any nature or respect, or owes a fiduciary or similar duty to the Company, in connection with such transaction or the process leading thereto.

17. This Agreement supersedes all prior agreements and understandings (whether written or oral) between the Company and the Underwriters, or any of them, with respect to the subject matter hereof.

18. This Agreement and any transaction contemplated by this Agreement shall be governed by and construed in accordance with the laws of the State of New York without regard to principles of conflict of laws that would result in the application of any other law than the laws of the State of New York. The Company agrees that any suit or proceeding arising in respect of this Agreement or any transaction contemplated by this Agreement will be tried exclusively in the U.S. District Court for the Southern District of New York or, if that court does not have subject matter jurisdiction, in any state court located in The City and County of New York and the Company agrees to submit to the jurisdiction of, and to venue in, such courts.

19. The Company and each of the Underwriters hereby irrevocably waives, to the fullest extent permitted by applicable law, any and all right to trial by jury in any legal proceeding arising out of or relating to this Agreement or the transactions contemplated hereby.

20. This Agreement may be executed by any one or more of the parties hereto in any number of counterparts, each of which shall be deemed to be an original, but all such counterparts shall together constitute one and the same instrument.

21. Notwithstanding anything herein to the contrary, the Company is authorized to disclose to any persons the U.S. federal and state income tax treatment and tax structure of the potential transaction and all materials of any kind (including tax opinions and other tax analyses) provided to the Company relating to that treatment and structure, without the Underwriters imposing any limitation of any kind. However, any information relating to the tax treatment and tax structure shall remain confidential (and the foregoing sentence shall not apply) to the extent necessary to enable any person to comply with securities laws. For this purpose, "tax structure" is limited to any facts that may be relevant to that treatment.

22. Recognition of the U.S. Special Resolution Regimes.

(a) In the event that any Underwriter that is a Covered Entity becomes subject to a proceeding under a U.S. Special Resolution Regime, the transfer from such Underwriter of this Agreement, and any interest and obligation in or under this Agreement, will be effective to the same extent as the transfer would be effective under the U.S. Special Resolution Regime if this Agreement, and any such interest and obligation, were governed by the laws of the United States or a state of the United States.

(b) In the event that any Underwriter that is a Covered Entity or a BHC Act Affiliate of such Underwriter becomes subject to a proceeding under a U.S. Special Resolution Regime, Default Rights under this Agreement that may be exercised against such Underwriter are permitted to be exercised to no greater extent than such Default Rights could be exercised under the U.S. Special Resolution Regime if this Agreement were governed by the laws of the United States or a state of the United States.

(c) As used in this section:

“BHC Act Affiliate” has the meaning assigned to the term “affiliate” in, and shall be interpreted in accordance with, 12 U.S.C. § 1841(k).

“Covered Entity” means any of the following:

(i) a “covered entity” as that term is defined in, and interpreted in accordance with, 12 C.F.R. § 252.82(b);

(ii) a “covered bank” as that term is defined in, and interpreted in accordance with, 12 C.F.R. § 47.3(b); or

(iii) a “covered FSI” as that term is defined in, and interpreted in accordance with, 12 C.F.R. § 382.2(b).

“Default Right” has the meaning assigned to that term in, and shall be interpreted in accordance with, 12 C.F.R. §§ 252.81, 47.2 or 382.1, as applicable.

“U.S. Special Resolution Regime” means each of (i) the Federal Deposit Insurance Act and the regulations promulgated thereunder and (ii) Title II of the Dodd-Frank Wall Street Reform and Consumer Protection Act and the regulations promulgated thereunder.

If the foregoing is in accordance with the understanding of the Representatives, please sign and return to us counterparts hereof, and upon the acceptance hereof by the Representatives, on behalf of each of the Underwriters, this letter and such acceptance hereof shall constitute a binding agreement between each of the Underwriters and the Company. It is understood that acceptance of the Representatives of this letter on behalf of each of the Underwriters is pursuant to the authority set forth in a form of Agreement among Underwriters, the form of which shall be submitted to the Company for examination, upon request, but without warranty on the part of the Representatives as to the authority of the signers thereof.

Very truly yours,

Adaptive Biotechnologies Corporation

By: _____
Name:
Title:

Accepted as of the date hereof:

Goldman Sachs & Co. LLC

By: _____
Name:
Title:

J.P. Morgan Securities LLC

By: _____
Name:
Title:

BofA Securities, Inc.

By: _____
Name:
Title:

On behalf of each of the Underwriters

SCHEDULE I

<u>Underwriter</u>	<u>Total Number of Firm Shares to be Purchased</u>	<u>Number of Optional Shares to be Purchased if Maximum Option Exercised</u>
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	<u> </u>	<u> </u>

SCHEDULE II

(a) Issuer Free Writing Prospectuses not included in the Pricing Disclosure Package:

Electronic roadshow dated [●]

(b) Additional Documents Incorporated by Reference:

[None]

(c) Information other than the Pricing Prospectus that comprise the Pricing Disclosure Package:

The initial public offering price per share for the Shares is \$[●]

The number of Shares purchased by the Underwriters is [●].

[Add any other pricing disclosure.]

(d) Section 5(d) Writings:

Form of Press Release**Adaptive Biotechnologies Corporation****[Date]**

Adaptive Biotechnologies Corporation (the “Company”) announced today that Goldman Sachs & Co. LLC, the lead book-running manager in the Company’s recent public sale of _____ shares of common stock, is [waiving] [releasing] a lock-up restriction with respect to _____ shares of the Company’s common stock held by [certain officers or directors] [an officer or director] of the Company. The [waiver] [release] will take effect on _____, 20____, and the shares may be sold on or after such date.

This press release is not an offer for sale of the securities in the United States or in any other jurisdiction where such offer is prohibited, and such securities may not be offered or sold in the United States absent registration or an exemption from registration under the United States Securities Act of 1933, as amended.

AMENDED AND RESTATED
ARTICLES OF INCORPORATION
OF
ADAPTIVE BIOTECHNOLOGIES CORPORATION

ARTICLE 1
NAME

The name of the corporation is Adaptive Biotechnologies Corporation.

ARTICLE 2
DURATION

The corporation 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 the corporation are as follows:

3.1 To engage in any lawful business.

3.2 To engage in any and all activities that, in the judgment of the Board of Directors of the corporation (the “*Board*”), may at any time be incidental or conducive to the attainment of the foregoing purpose.

3.3 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 corporation shall have authority to issue 350,000,000 shares of capital stock, of which 340,000,000 shares will be common stock, \$0.0001 par value per share (the “*Common Stock*”), and 10,000,000 shares will be preferred stock, par value \$0.0001 per share (the “*Preferred Stock*”).

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 corporation upon dissolution. The relative rights, preferences, privileges and restrictions granted to or imposed upon the Common Stock and the holders thereof are as follows:

4.2.1 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, out of any funds of the corporation legally available therefor, such cash and other dividends as may be declared from time to time by the Board.

4.2.2 Liquidation Rights. In the event of any liquidation, dissolution or winding up of the affairs of the corporation, whether voluntary or involuntary, the holders of issued and outstanding shares of Common Stock shall be entitled to receive ratably, based on the total number of shares of Common Stock held by each, all the assets and funds of the corporation 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.

4.2.3 Voting Rights. Each holder of Common Stock shall be entitled to one vote for each share of Common Stock held.

4.3 Preferred Stock. The authorized shares of Preferred Stock may be divided into and issued in series. Authority is vested in the Board, subject to the limitations and procedures set forth herein or as 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 Amended and Restated Articles of Incorporation (these "**Articles**") or in the resolution of the Board establishing a series, the Board, 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. The authority herein granted to the Board to determine the relative rights and preferences of the Preferred Stock shall be limited to unissued shares, and no power shall exist to alter or change the rights and preferences of any shares that have been issued. Preferred Stock, or any series thereof, may have rights that are identical to those of Common Stock. 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 corporation 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 Issuance of Certificates. The Board shall have the authority to issue shares of the capital stock of the 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.

4.5 No Cumulative Voting. Shareholders of the corporation shall not have the right to cumulate votes for the election of directors.

4.6 No Preemptive Rights; Exception. No shareholder of the corporation shall have, solely by reason of being a shareholder, any preemptive or preferential right or subscription right to any stock of the corporation or to any obligations convertible into stock of the corporation, or to any warrant or option for the purchase thereof, except to the extent provided by resolution or resolutions of the Board establishing a series of Preferred Stock or by written agreement with the corporation.

4.7 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 shares entitled to vote.

4.8 Calling of Special Meeting of Shareholders. Special meetings of the shareholders for any purpose or purposes may be called at any time only by the Board, the Chairperson of the Board (if one be appointed), the Chief Executive Officer of the corporation or the President of the corporation. Special meetings of the shareholders may not be called by any other person or persons.

4.9 Shareholder Voting on Extraordinary Actions. The vote of shareholders of the corporation required in order to approve amendments to these Articles, a plan of merger or share exchange, the sale, lease, exchange, or other disposition of all or substantially all of the property of the corporation not in the usual and regular course of business, or dissolution of the corporation, shall be a majority of all of the votes entitled to be cast by each voting group entitled to vote thereon.

ARTICLE 5 DIRECTORS

5.1 Number of Directors. The number of directors of the corporation shall be fixed as provided in the Amended and Restated Bylaws of the corporation, as amended from time to time (the "*Bylaws*"), and may be increased or decreased from time to time in the manner specified therein.

5.2 Terms of Directors. From and after the effectiveness of these Articles (the "*Effective Time*"), the directors shall be divided into three (3) classes as nearly equal in size as is practicable, designated as Class I, Class II and Class III, respectively. Directors shall be assigned to each class in accordance with a resolution or resolutions adopted by the Board. At the first regularly-scheduled annual meeting of shareholders following the Effective Time, the term of office of the Class I directors shall expire and Class I directors shall be elected for a full term of three (3) years. At the second annual meeting of shareholders following the Effective Time, the term of office of the Class II directors shall expire and Class II directors shall be elected for a full term of three (3) years. At the third annual meeting of shareholders following the Effective Time, the term of office of the Class III directors shall expire and Class III directors shall be elected for a full term of three (3) years. At each succeeding annual meeting of shareholders, directors shall be elected for a full term of three (3) years to succeed the directors of the class whose terms expire at such annual meeting. Notwithstanding the foregoing provisions of this section, each director shall serve until his or her successor is duly elected and qualified or until his or her earlier death, resignation or removal. If the number of directors is hereafter changed, any newly created directorships or decrease in directorships shall be so apportioned among the classes as to make all classes as nearly equal in number as is practicable, *provided* that no decrease in the number of directors constituting the Board shall shorten the term of any incumbent director.

5.3 Removal of Directors. Neither the Board nor any individual director may be removed without cause. Subject to any limitation imposed by law, any individual director or directors may be removed with cause 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) exceeds the number of votes cast against removal.

5.4 Vacancies. Any vacancies on the Board resulting from death, resignation, removal or other causes and any newly created directorships resulting from any increase in the number of directors shall be filled only by the affirmative vote of a majority of the remaining directors or the sole remaining director. Unless the Board otherwise provides in a notice of a special meeting of the shareholders given pursuant to the Bylaws or unless there are no directors in office, the shareholders shall not be entitled to vote to fill vacancies on the Board. The term of a director elected to fill a vacancy expires at the next election of directors by the shareholders.

5.5 Authority of Board of Directors to Amend Bylaws. Subject to the limitation(s) of RCW 23B.10.210, and subject to the power of the shareholders of the corporation to change or repeal the Bylaws (as limited by RCW 23B.02.060(4) and 23B.08.010(2)(b)), the Board is expressly authorized to make, amend or repeal the Bylaws of the corporation unless the shareholders in amending or repealing a particular Bylaw provide expressly that the Board may not amend or repeal that Bylaw.

ARTICLE 6 INDEMNIFICATION OF DIRECTORS AND OFFICERS

6.1 Definitions. The capitalized terms in this Section 6 shall have the meanings set forth in RCW 23B.08.500.

6.2 Indemnification Rights of Directors and Officers. The corporation shall indemnify and hold harmless each individual who is or was serving as a Director or officer of the Corporation or who, while serving as a Director or officer of the corporation, is or was serving at the request of the corporation 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 (1) acts or omissions of the Director or officer finally adjudged to be intentional misconduct or a knowing violation of law; (2) conduct of the Director or officer finally adjudged to be in violation of RCW 23B.08.310; or (3) 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.

6.3 Amendment(s) to the Act. If, after the effective date of this Section 6.3, the Act is amended to authorize further indemnification of Directors or officers, then Directors and officers of the corporation shall be indemnified to the fullest extent permitted by the Act.

6.4 Non-Exclusive Rights. To the extent permitted by law, the rights to indemnification and advance of reasonable Expenses conferred in this Section 6.4 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 6.4 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 6.4 shall not adversely affect any right or protection of a Director or officer of the corporation for or with respect to any acts or omissions of such Director or officer occurring prior to such amendment or repeal.

6.5 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 corporation shall not be personally liable to the corporation or its shareholders for monetary damages for conduct as a director. Any amendment to or repeal of this Section 6.5 shall not adversely affect a director of this corporation with respect to any conduct of such director occurring prior to such amendment or repeal.

**ARTICLE 7
AUTHORITY TO AMEND THE ARTICLES OF INCORPORATION**

This corporation reserves the right to amend or repeal any of the provisions contained in these Articles in any manner now or hereafter permitted by the Act or by these Articles and the rights of the shareholders of this corporation are granted subject to this reservation.

7.1 Supermajority Voting. The amendment or repeal of the provisions in any of the following Articles or sections listed in this Section 7.1 shall require the affirmative vote of the holders of not less than two-thirds of all the votes entitled to be cast thereon by the shareholders of this corporation, voting together as a single group: Section 4.8 (“Calling of Special Meeting of Shareholders”), Article 5 (“Directors”), Article 6 (“Indemnification of Directors and Officers”), Section 7.1 (“Supermajority Voting”) or Article 8 (“Bylaws”).

7.2 Correction of Clerical Errors. The corporation 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.

**ARTICLE 8
BYLAWS**

The Bylaws may be altered, amended or repealed and new Bylaws may be adopted by the Board, except that the Board may not amend or repeal any Bylaw that the shareholders (subject to the limitation(s) of RCW 23B.02.060(4) and 23B.08.010(2)(b)) have expressly provided, in amending or repealing the Bylaw, may not be amended or repealed by the Board. The shareholders may also alter, amend and repeal the Bylaws or adopt new Bylaws (in each case subject to the limitation(s) of RCW 23B.02.060(4) and 23B.08.010(2)(b)); *provided, however*, that the affirmative vote of the holders of at least two-thirds of all the votes entitled to be cast by the shareholders of this corporation generally in the election of directors, voting together as a single class, shall be required for the shareholders of this corporation to alter, amend or repeal any provision of the Bylaws or to adopt new Bylaws.

**ARTICLE 9
SAVINGS CLAUSE**

If any provision of these Articles is declared by a court of competent jurisdiction to be invalid, unenforceable or contrary to applicable law, the remainder of these Articles shall be enforceable in accordance with their terms.

**ARTICLE 10
EXCLUSIVE FORUM**

Unless the corporation consents 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 the corporation’s 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 Act, these Articles or the Bylaws (as either may be amended from time to time), or (iv) asserting a claim concerning the corporation’s internal affairs that is not included in clause (i) through (iii) above, in all cases to the fullest extent permitted by law and subject to the court’s having personal jurisdiction over the indispensable parties named as defendants. This Article 10 does not apply to suits brought to enforce a duty or liability created by the Securities Exchange Act of 1934, as amended, or any other claim for which the federal courts have exclusive jurisdiction.

Unless the corporation consents in writing to the selection of an alternative forum, the federal district courts of the United States of America shall be the exclusive forum for the resolution of any complaint asserting a cause of action arising under the Securities Act of 1933, as amended, subject to applicable law.

Any person or entity purchasing or otherwise acquiring any interest in any security of the corporation shall be deemed to have notice of and consented to the provisions of this Article 10.

Dated this ____ day of _____, 2019.

Name: _____
Title: _____

**CERTIFICATE OF OFFICER REGARDING
RESTATED ARTICLES OF INCORPORATION
OF
ADAPTIVE BIOTECHNOLOGIES CORPORATION**

Adaptive Biotechnologies Corporation, a Washington corporation the ("**Corporation**"), by Chad Robins, its duly elected and qualified Chief Executive Officer, hereby delivers to the Secretary of State of the State of Washington for filing the Amended and Restated Articles of Incorporation, pursuant to RCW 23B.10.

1. The name of the Corporation is Adaptive Biotechnologies Corporation
2. The Amended and Restated Articles of Incorporation 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 of the Corporation on _____, 2019.
4. Such amendments and restatement were duly approved by the shareholders of the Corporation on _____, 2019 in accordance with the provisions of RCW 23B.10.030, 23B.10.040 and 23B.01.070 of the Washington Business Corporation Act.
5. The Amended and Restated Articles of Incorporation will be effective upon filing.

Dated as of _____, 2019.

ADAPTIVE BIOTECHNOLOGIES CORPORATION

Name: _____

Title: _____

EXHIBIT A

AMENDED AND RESTATED ARTICLES OF INCORPORATION

[See attached.]

**AMENDED AND RESTATED BYLAWS
OF
ADAPTIVE BIOTECHNOLOGIES CORPORATION
(Incorporated under the Laws of Washington)
(Effective _____, 2019)**

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AMENDED AND RESTATED BYLAWS
OF
ADAPTIVE BIOTECHNOLOGIES CORPORATION

ARTICLE I
DEFINITIONS

As used in these Bylaws, the following terms shall have the following meanings:

“**Articles of Incorporation**” means the corporation’s Articles of Incorporation and all amendments as filed with the Washington Secretary of State.

“**Board**” means the board of directors of the corporation.

“**Bylaws**” means these Amended and Restated Bylaws of the corporation, as amended from time to time.

The “**corporation**” means Adaptive Biotechnologies Corporation, a Washington corporation.

“**Electronic transmission**” means an electronic communication (a) not directly involving the physical transfer of a record in a tangible medium and (b) that may be retained, retrieved and reviewed by the sender and the recipient thereof, and that may be directly reproduced in a tangible medium by such a sender and recipient.

“**Exchange Act**” means the Securities Exchange Act of 1934, as amended.

“**Execute,**” “**executes**” or “**executed**” means signed with respect to a written record or electronically transmitted along with sufficient information to determine the sender’s identity with respect to an electronic transmission.

“**RCW**” means the Revised Code of Washington and “**RCW 23B**” means Title 23B of the Revised Code of Washington (also known as the Washington Business Corporation Act).

“**Record**” means information inscribed on a tangible medium or contained in an electronic transmission.

“**Tangible medium**” means a writing, copy of a writing or facsimile or a physical reproduction, each on paper or on other tangible material.

“**Washington Business Corporation Act**” means the Washington Business Corporation Act, as amended from time to time.

“**Writing**” or “**written**” means embodied in a tangible medium, and excludes an electronic transmission.

ARTICLE II
SHAREHOLDERS

2.1 ANNUAL 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.

2.2 SPECIAL MEETINGS

Special meetings of the shareholders for any purpose or purposes may be called at any time only by the Board, the Chairperson of the Board (if one be appointed), the Chief Executive Officer of the corporation or the President of the corporation. Special meetings of the shareholders may not be called by any other person or persons. Business transacted at any special meeting of shareholders shall be confined to the purpose or purposes stated in the notice of meeting.

2.3 NOTICE OF MEETINGS.

2.3.1 Content and Timing of Notice.

(a) Notice stating the date, time and place of the meeting, any information required by the corporation's Articles of Incorporation or these Bylaws and, in the case of a special meeting, the purpose or purposes for which the meeting is called, will be delivered not less than ten (10) nor more than sixty (60) days before the date of the meeting, unless a purpose of the meeting is to act on an amendment to the Articles of Incorporation, a plan of merger or share exchange, a proposed sale of all or substantially all of the assets of the corporation, or the dissolution of the corporation, in which case notice will be delivered not less than twenty (20) nor more than sixty (60) days before the date of the meeting.

(b) If the business to be conducted at any meeting includes (i) any proposed amendment to the Articles of Incorporation, (ii) any proposed merger or exchange of shares, (iii) any proposed sale, lease, exchange or other disposition of all or substantially all of the property and assets of the corporation not in the usual or regular course of its business or (iv) any proposed voluntary dissolution of the corporation, then the written notice shall state that the purpose or one of the purposes is to consider the proposed action and 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 this Section 2.3.

2.3.2 Type and Effectiveness of Notice. Notice to shareholders may be given by personal delivery, mail, private carrier, telegraph, teletype, facsimile transmission (with confirmation of receipt) or, with the consent of the shareholder entitled to receive notice, by electronic transmission. Notice given by personal delivery is effective when received by a shareholder. Notice given by mail is effective when deposited in the U.S. mail, if delivered by postage prepaid envelope directed to each shareholder at such shareholder's address as it appears in the records of the corporation. Notice given by private carrier is effective when dispatched, if prepaid and properly addressed to the shareholder at the shareholder's address as it appears in the records of the corporation. Notice given by telegraph, teletype or facsimile transmission (with confirmation of receipt) is effective when dispatched to the shareholder's address, telephone number or other number appearing on the records of the corporation. Notice given by electronic transmission pursuant to this subsection shall be deemed given: (i) if by electronic mail, when directed to an electronic mail address at which the shareholder has consented to receive notice; (ii) if by posting on an electronic

network together with separate notice to the shareholder of such specific posting, upon the later of (A) such posting and (B) the giving of such separate notice; and (iii) if by any other form of electronic transmission, when directed to the shareholder. An affidavit of the Secretary or an Assistant Secretary or of the transfer agent or other agent of the corporation that the notice has been given by personal delivery, by mail, by private carrier, by telegraph, teletype or facsimile transmission or by a form of electronic transmission shall, in the absence of fraud, be prima facie evidence of the facts stated therein.

2.3.3 Waiver of Notice. A shareholder may waive any notice required by these Bylaws, the Articles of Incorporation or the Washington Business Corporation Act before or after the date and time of the meeting that is the subject of the notice. 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.

2.4 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. Where a separate class vote by a class or classes or series is required, a majority of the shares of such class or classes or series present in person or represented by proxy shall constitute a quorum entitled to take action with respect to that vote on that matter. 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, contract or by the Articles of Incorporation or these Bylaws.

2.5 ADJOURNMENTS

Any meeting of shareholders may be adjourned to any other time and to any other place at which a meeting of shareholders may be held under these Bylaws by the chairperson of the meeting or, in the absence of such person, by any officer entitled to preside at or to act as secretary of such meeting, or by the holders of a majority of the shares of stock present or represented at the meeting and entitled to vote, although less than a quorum. When a meeting is adjourned to another place, date or time, written notice need not be given of the adjourned meeting if the date, time and place, if any, thereof, and the means of remote communication, if any, by which shareholders and proxy holders may be deemed to be present in person and vote at such adjourned meeting, are announced at the meeting at which the adjournment is taken;

provided, however, that if the Board fixes a new record date for determining the shareholders entitled to vote at the adjourned meeting in accordance with Section 2.6, written notice of the place, if any, date and time of the adjourned meeting and the means of remote communication, if any, by which shareholders and proxy holders may be deemed to be present in person and vote at such adjourned meeting, shall be given in conformity herewith. At the 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.

2.6 RECORD DATE

For the purpose of determining shareholders entitled to notice of or to vote at any meeting of shareholders or any adjournment of a meeting, the Board may fix a future date as the record date for the determination. The record date shall be not less than ten (10) nor more than seventy (70) days prior to the date of the meeting. If no record date is fixed for the determination of shareholders entitled to notice of or to vote at a meeting, the record date shall be the day immediately preceding the date on which notice of the meeting is first given to 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. The determination of the record date shall apply to any adjournment of the meeting unless the Board fixes a new record date, which it shall do if the meeting is adjourned for more than one hundred twenty (120) days after the date fixed for the original meeting.

2.7 ORGANIZATION OF MEETINGS

Meetings of the shareholders shall be presided over by the Chairperson of the Board, or if a Chairperson of the Board has not been appointed or is not present, by the Chief Executive Officer, or if the Chief Executive Officer is not present, by a chairperson to be chosen by the Chief Executive Officer or the Board. Such person shall have absolute authority over all matters of procedure for any meeting or any part thereof. In the absence of the Secretary of the corporation, the secretary of the meeting shall be such person as the chairperson of the meeting appoints.

2.8 PROXIES

At all meetings of shareholders, a shareholder may vote by proxy executed in writing by the shareholder or by his, her or its duly authorized attorney in fact. Such proxy shall be filed with the Secretary of the corporation or other officer of the corporation or agent authorized to tabulate votes before or at the time of the meeting. No proxy shall be valid after eleven (11) months from the date of its execution, unless otherwise provided in such proxy. Any proxy regular on its face shall be presumed to be valid.

2.9 MEETINGS BY COMMUNICATIONS EQUIPMENT

Shareholders may participate in any meeting of the shareholders by any means of telephone or similar communication equipment by which all persons participating in the meeting can hear each other during the meeting, and participation in this manner shall constitute presence in person at a meeting.

2.10 VOTING LIST

At least ten (10) days before each meeting of shareholders, a complete list of the shareholders entitled to vote at such meeting, or any adjournment thereof, shall be made. Such list shall be arranged in alphabetical order with the address of and number of shares held by each shareholder. Such record shall be kept on file at the principal office of the corporation for a period of ten (10) days prior to such meeting. The record shall be produced and kept open at the time and place of such meeting for the inspection of any shareholder. Failure to comply with the requirements of this section shall not affect the validity of any action taken at such meeting.

2.11 NOTICE OF SHAREHOLDER BUSINESS TO BE CONDUCTED AT THE ANNUAL MEETING OF SHAREHOLDERS; ADVANCE NOTICE PROCEDURES

2.11.1 Generally. At any annual meeting of shareholders, only such business (other than nominations for election of directors, which is governed by Section 3.16 of these Bylaws) shall be conducted or considered as shall have been properly brought before the meeting. To be properly brought before an annual meeting, business must be either (a) specified in the notice of meeting (or any supplement thereto) given by or at the direction of the Board, (b) otherwise properly brought before the meeting by or at the direction of the Board, or (c) otherwise properly brought before the meeting by a shareholder who (i) is a shareholder of record (and, with respect to any beneficial owner, if different, on whose behalf such business is proposed, only if such beneficial owner is the beneficial owner of shares of the corporation) both at the time of giving the notice provided for in this Section 2.11 and at the time of the meeting, (ii) is entitled to vote at the meeting and (iii) has complied with the notice procedures set forth in this Section 2.11 as to such business. For any business to be properly brought before an annual meeting by a shareholder (other than nominations for election of directors, which is governed by Section 3.16 of these Bylaws), it must be a proper matter for shareholder action under the Washington Business Corporation Act, and the shareholder must have given timely notice thereof in writing to the Secretary of the corporation.

2.11.2 Timely Notice To be timely, a shareholder's notice shall be in writing and must be received at the corporation's principal executive offices not later than ninety (90) nor earlier than one hundred twenty (120) prior to the first anniversary of the date of the corporation's proxy statement released to shareholders in connection with the previous year's annual meeting; *provided, however*, that if no annual meeting was held in the previous year or the date of the annual meeting is advanced by more than thirty (30) days, or delayed (other than as a result of adjournment) by more than thirty (30) days from the anniversary of the previous year's annual meeting, notice by the shareholder to be timely must be received not later than the close of business on the later of the ninetieth (90th) day prior to such annual meeting or the tenth (10th) day following the date on which public announcement of the date of such meeting is first made. "Public announcement" for purposes hereof shall have the meaning set forth in Section 3.16.4 of these Bylaws. In no event shall the public announcement of an adjournment or postponement of an annual meeting commence a new time period (or extend any time period) for the giving of a shareholder's notice as described above.

2.11.3 Proper Form A shareholder's notice to the Secretary of the corporation shall set forth (a) as to each matter the shareholder proposes to bring before the meeting, a brief description of the business desired to be brought before the meeting and the text of the proposal or business, including the text of any resolutions proposed for consideration and in the event that such business includes a proposal to amend the Bylaws, the language of the proposed amendment, and (b) as to the shareholder giving the notice and the beneficial owner, if any, on whose behalf the proposal is being made, and any of their respective affiliates or associates or others acting in concert therewith (each, a "**Proposing Person**"), (i) the name and address, as they appear on the corporation's books, of the shareholder proposing such business and of any other Proposing Person, (ii) the class or series and number of shares of the corporation which are owned beneficially and of record by the shareholder and any other Proposing Person as of the date of the notice, and a representation that the shareholder will notify the corporation in writing within five (5) business days after the record date for voting at the meeting of the class or series and number of shares of the corporation owned beneficially and of record by the shareholder and any other Proposing Person as of the record date for voting at the meeting, (iii) a representation that the shareholder intends to appear in person or by proxy at the meeting to propose the business specified in the notice, (iv) any material interest of the shareholder

and any other Proposing Person in such business, (v) the following information regarding the ownership interests of the shareholder and any other Proposing Person which shall be supplemented in writing by the shareholder not later than ten (10) days after the record date for voting at the meeting to disclose such interests as of such record date: (A) a description of any option, warrant, convertible security, stock appreciation right or similar right with an exercise or conversion privilege or a settlement payment or mechanism at a price related to any class or series of shares of the corporation or with a value derived in whole or in part from the value of any class or series of shares of the corporation, any derivative or synthetic arrangement having the characteristics of a long position in any class or series of shares of the corporation, or any contract, derivative, swap or other transaction or series of transactions designed to produce economic benefits and risks that correspond substantially to the ownership of any class or series of shares of the corporation, including due to the fact that the value of such contract, derivative, swap or other transaction or series of transactions is determined by reference to the price, value or volatility of any class or series of shares of the corporation, whether or not such instrument, contract or right shall be subject to settlement in the underlying class or series of shares of the corporation, through the delivery of cash or other property, or otherwise, and without regard to whether the shareholder of record or any other Proposing Person may have entered into transactions that hedge or mitigate the economic effect of such instrument, contract or right (a “**Derivative Instrument**”) directly or indirectly owned beneficially by such shareholder or other Proposing Person, and any other direct or indirect opportunity to profit or share in any profit derived from any increase or decrease in the value of shares of the corporation; (B) a description of any proxy, contract, arrangement, understanding or relationship pursuant to which such shareholder or other Proposing Person has a right to vote any shares of any security of the corporation (other than revocable proxies received pursuant to a solicitation of proxies in accordance with the Exchange Act); (C) a description of any agreement, arrangement, understanding, relationship or otherwise, including any repurchase or similar so-called “stock borrowing” agreement or arrangement, engaged in, directly or indirectly, by such shareholder or other Proposing Person, the purpose or effect of which is to mitigate loss to, reduce the economic risk (of ownership or otherwise) of any class or series of the shares of the corporation by, manage the risk of share price changes for, or increase or decrease the voting power of, such shareholder or other Proposing Person with respect to any class or series of the shares of the corporation, or which provides, directly or indirectly, the opportunity to profit or share in any profit derived from any decrease in the price or value of any class or series of the shares of the corporation (“**Short Interests**”); (D) a description of any rights to dividends on the shares of the corporation owned beneficially by such shareholder or other Proposing Person that are separated or separable from the underlying shares of the corporation; (E) a description of any proportionate interest in shares of the corporation or Derivative Instruments held, directly or indirectly, by a general or limited partnership in which such shareholder or other Proposing Person is a general partner or, directly or indirectly, beneficially owns an interest in a general partner; (F) a description of any performance-related fees (other than an asset-based fee) to which such shareholder or other Proposing Person is entitled based on any increase or decrease in the value of shares of the corporation or Derivative Instruments, if any, as of the date of such notice, including, without limitation, any such interests held by members of such shareholder’s or other Proposing Person’s immediate family sharing the same household; (G) a description of any significant equity interests or any Derivative Instruments or Short Interests in any principal competitor of the corporation held by such shareholder or other Proposing Person; and (H) a description of any direct or indirect interest of such shareholder or other Proposing Person in any contract with the corporation, any affiliate of the corporation or any principal competitor of the corporation (including, in any such case, any employment agreement, collective bargaining agreement or consulting agreement), and (vi) any other information relating to such shareholder or other Proposing Person, if any, that would be required to be disclosed in a proxy statement or other filings required to be made in connection with solicitations of proxies for, as applicable, the proposal and/or for the election of directors in a contested election pursuant to Section 14 of the Exchange Act, and the rules and regulations promulgated thereunder. The terms “associate” and “beneficially owned” for purposes hereof shall have the meanings set forth in Section 3.16.4 of these Bylaws.

2.11.4 Waiver. Unless otherwise required by law, if the shareholder (or a qualified representative of the shareholder) does not appear at the annual meeting or a special meeting of shareholders to present the proposed business, such proposed business shall not be transacted, notwithstanding that proxies in respect of such vote may have been received by the corporation. For purposes of this section, to be considered a qualified representative of the shareholder, a person must be a duly authorized officer, manager or partner of such shareholder or authorized by a writing executed by such shareholder (or a reliable reproduction or electronic transmission of the writing) delivered to the corporation prior to the making of such proposal at such meeting by such shareholder stating that such person is authorized to act for such shareholder as proxy at the meeting of shareholders.

2.11.5 Compliance with the Exchange Act Notwithstanding the foregoing provisions of this Section 2.11, a shareholder shall also comply with all applicable requirements of the Exchange Act and the rules and regulations thereunder with respect to the matters set forth in this Section 2.11; *provided, however,* that any references in this Section 2.11 to the Exchange Act or the rules and regulations promulgated thereunder are not intended to and shall not limit any requirements applicable to proposals as to any business to be considered pursuant to this Section 2.11. Nothing in this Section 2.11 shall be deemed to affect any rights (a) of shareholders to request inclusion of proposals in, or the corporation to omit proposals from, the corporation's proxy statement pursuant to Rule 14a-8 under the Exchange Act or (b) of the holders of any series of preferred stock if and to the extent provided for under law, the Articles of Incorporation or these Bylaws.

Notwithstanding any provisions to the contrary, the notice requirements set forth in Sections 2.11.1 and 2.11.3 above shall be deemed satisfied by a shareholder if the shareholder has notified the corporation of the shareholder's intention to present a proposal at an annual meeting in compliance with applicable rules and regulations promulgated under the Exchange Act and such shareholder's proposal has been included in a proxy statement that has been prepared by the corporation to solicit proxies for such annual meeting.

2.12 INSPECTORS OF ELECTION

Before any meeting of shareholders, the Board 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, then the chairperson 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 chairperson 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 238.07.220 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.

ARTICLE III
BOARD OF DIRECTORS

3.1 RESPONSIBILITY OF BOARD OF DIRECTORS

The business and affairs and property of the corporation shall be managed under the direction of the Board. 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.

3.2 NUMBER AND TERM OF OFFICE

3.2.1 Number of Directors. The authorized number of directors of the corporation will be determined from time to time by resolution of the Board. 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 the State of Washington. Each director must be at least eighteen (18) years of age.

3.2.2 Election and Term of Office. At each annual meeting of shareholders, the shareholders shall elect directors. Each director shall hold office for the term for which he or she is elected and until his or her successor is duly elected and qualified or until his or her earlier death, resignation or removal.

3.3 VACANCIES

Any vacancy occurring in the Board shall be filled as provided in the Articles of Incorporation.

3.4 QUORUM

3.4.1 Board of Directors Meetings. Except in particular situations where a lesser number is expressly permitted by law or this Section 3.4.1, and unless a greater number is required by the Articles of Incorporation, a majority of the number of directors 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 unless a different vote is specified by law, the Articles of Incorporation or these Bylaws. If the number of directors in office at any time is less than the number 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.

3.4.2 Initial Quorum. Directors at a meeting of the Board 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.

3.4.3 Adjournment. A majority of the directors present, whether or not constituting a quorum, may adjourn any meeting of the Board 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 3.10 of these Bylaws, to the directors who were not present at the time of the adjournment.

3.5 REMOVAL OF DIRECTORS

A director may only be removed as provided in the Articles of Incorporation.

3.6 RESIGNATION

A director may resign at any time by delivering written notice to the Board, the Chairperson of the Board, the Chief Executive Officer, the President or the Secretary. A resignation is effective when the notice is delivered unless the notice specifies a later effective date.

3.7 ANNUAL MEETING

The first meeting of each newly elected Board 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 the Board 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.

3.8 REGULAR MEETINGS

3.8.1 Regular Meetings. Regular meetings of the Board of Directors may be held without notice at such place, day, and time as shall from time to time be fixed by resolution of the Board.

3.8.2 Regular Committee Meetings. Regular meetings of any committee designated by the Board may be held at the principal place of business of the corporation or at such other place or places, either within or without the State of Washington as such committee may from time to time designate. The schedule for meetings of any committee shall be set by said committee.

3.9 SPECIAL MEETINGS

3.9.1 Special Meetings. Special meetings of the Board may be called by or at the request of the Chairperson of the Board, the Chief Executive Officer, the President or any director, to be held at such place, day and time as specified by the person or persons calling the meeting.

3.9.2 Special Committee Meetings. Special meetings of any committee may be called at any time by such person or persons and with such notice as shall be specified for such committee by the Board, or in the absence of such specification, in the manner and with the notice required for special meetings of the Board.

3.10 NOTICE OF SPECIAL MEETINGS

3.10.1 Content and Timing of Notice. Notice of a special Board or committee meeting stating the place, day and hour of the meeting shall be provided to each director on the Board or committee, as applicable, in the form of a record or orally, as provided in this Section 3.10. Neither the business to be transacted at nor the purpose of any special meeting need be specified in the notice of the meeting. Notice of the meeting shall be given at least two (2) days prior to the day on which the meeting is to be held.

3.10.2 Type of Notice. Notice may be provided by: (a) oral notice in person or by telephone, (b) written notice by mail, private carrier, personal delivery, telegraph, teletype or facsimile transmission (with confirmation of receipt) or (c) with the consent of the director entitled to receive notice, by electronic transmission.

3.10.3 Effectiveness of Notice. Notice given orally or by personal delivery is effective when received by a director. Notice given by mail is effective five (5) days after its deposit in the U.S. mail, as evidenced by the postmark, if delivered by postage prepaid envelope directed to each director at such director's address as it appears in the records of the corporation. Notice given by private carrier is effective when delivered to the director's address as it appears in the records of the corporation. Notice given by telegraph, teletype or facsimile transmission (with confirmation of receipt) is effective when dispatched to the director's address, telephone number or other number appearing on the records of the corporation. Notice given by electronic transmission pursuant to this subsection shall be deemed given: (a) if by electronic mail, when directed to an electronic mail address at which the director has consented to receive notice; (b) if by posting on an electronic network together with separate notice to the director of such specific posting, upon the later of (i) such posting and (ii) the giving of such separate notice; and (c) if by any other form of electronic transmission, when directed to the director. An affidavit of the Secretary or an Assistant Secretary or of the transfer agent or other agent of the corporation that the notice has been given by personal delivery, by mail, by private carrier, by telegraph, teletype or facsimile transmission or by a form of electronic transmission shall, in the absence of fraud, be prima facie evidence of the facts stated therein.

3.11 WAIVER OF NOTICE

3.11.1 Waiver by Delivery of a Record. A director may waive any notice required to be given to any director under the provisions of these Bylaws, the Articles of Incorporation or the Washington Business Corporation Act, before or after the date and time stated in the notice, and the waiver shall be equivalent to the giving of notice. The waiver must be delivered to the corporation by the director entitled to the notice for inclusion in the minutes or filing with the corporate records. The waiver shall be set forth either in an executed written record or in an executed and dated electronically transmitted record.

3.11.2 Waiver by Attendance. A director's attendance at or participation in a Board or committee meeting shall constitute a waiver of notice of the meeting, unless the director at the beginning of the meeting, or promptly upon his or her arrival, objects to holding the meeting or transacting business at the meeting and does not vote for or assent to action taken at the meeting.

3.11.3 Dissent by Directors. Any director who is present at any meeting of the Board 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.

3.12 COMMITTEES

The Board may, in its discretion, by resolution passed by a majority of the whole Board, appoint various committees consisting of two (2) or more members of the Board, including an Executive Committee, which shall have and may exercise such powers as shall be conferred or authorized by the resolution appointing such committee. A majority of any such committee, composed of more than two (2) members of the Board, may determine its action and fix the time and place of its meetings, unless the Board shall otherwise provide. The Board shall have the power at any time to change the members of any such committee, to fill vacancies, and to discharge any such committee. Committees of directors may exercise the authority of the Board 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; (b) approve or propose to shareholders action that by law is required to be approved by shareholders; (c) fill vacancies on the Board or on any of its committees; (d) amend the Articles of Incorporation; (e) adopt, amend or repeal these 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 may authorize a committee of directors (or a senior executive officer of the corporation) to do so within limits specifically prescribed by the Board.

3.13 ACTION BY WRITTEN CONSENT

Any action required or which might be taken at a meeting of the Board or of a committee thereof may be taken without a meeting if a consent in writing, setting forth the action so taken or to be taken, shall be signed by all of the directors, or all of the members of the committee, as the case may be. Such consent shall be filed in the corporation's minute book, or with the records of the committee so acting. 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.

3.14 MEETINGS BY COMMUNICATIONS EQUIPMENT

Members of the Board or any committee designated by the Board may participate in a meeting of the Board or committee by means of a conference telephone or similar communication equipment by which all persons participating in the meeting can hear each other at the meeting. Participation by such means will constitute presence in person at a meeting.

3.15 COMPENSATION OF DIRECTORS

By resolution of the Board or a committee thereof, or as otherwise permitted by applicable law, rule or regulation, the directors may be paid their expenses, if any, and may be paid a fixed sum, stated salary or other compensation as a director, for attendance at each meeting of the Board and any committee meeting thereof. No such payment shall preclude any director from serving the corporation in any other capacity and receiving compensation therefore.

3.16 NOMINATION OF DIRECTOR CANDIDATES

3.16.1 Nominations for Directors. Subject to the rights of holders of any class or series of preferred stock then outstanding, nominations for the election of directors at an annual meeting may be made by (a) the Board or a duly authorized committee thereof or (b) any shareholder of the corporation who is a shareholder of record at the time of giving the notice provided for in Sections 3.16.2 and 3.16.3, who is entitled to vote at the meeting and who complies with the procedures set forth in this Section 3.16.

3.16.2 Director Nomination Procedures. All nominations by shareholders must be made pursuant to timely notice given in writing to the Secretary of the corporation. To be timely, a shareholder's nomination for a director to be elected at an annual meeting must be received at the corporation's principal executive offices not later than ninety (90) days nor earlier than one hundred twenty (120) days prior to the first anniversary of the date of the corporation's proxy statement released to shareholders in connection with the previous year's annual meeting; *provided, however*, that if no annual meeting was held in the previous year or the date of the annual meeting is advanced by more than thirty (30) days or delayed (other than as a result of adjournment) by more than thirty (30) days from the first anniversary of the previous year's annual meeting, notice by the shareholder to be timely must be received not later than the close of business on the later of the ninetieth (90th) day prior to such annual meeting or the tenth (10th) day following the date on which public announcement of the date of such meeting is first made. Each such notice shall set forth (a) as to the shareholder and the beneficial owner, if any, on whose behalf the nomination is being made, and any of their respective affiliates or associates or others acting in concert therewith (each, a "**Nominating Person**"), (i) the name and address, as they appear on the corporation's books, of the shareholder who intends to make the nomination and of any other Nominating Person, (ii) the class or series and number of shares of the corporation which are owned beneficially and of record by the shareholder and any other Nominating Person as of the date of the notice, and a representation that the shareholder will notify the corporation in writing within five (5) business days after the record date for voting at the meeting of the class or series and number of shares of the corporation owned beneficially and of record by the shareholder and any other Nominating Person as of the record date for voting at the meeting, (iii) a representation that the shareholder intends to appear in person or by proxy at the meeting to nominate the nominee specified in the notice, (iv) the following information regarding the ownership interests of the shareholder and any other Nominating Person, which shall be supplemented in writing by the shareholder not later than ten (10) days after the record date for notice of the meeting to disclose such interests as of such record date: (A) a description of any Derivative Instrument directly or indirectly owned beneficially by such shareholder or other Nominating Person, and any other direct or indirect opportunity to profit or share in any profit derived from any increase or decrease in the value of shares of the corporation; (B) a description of any proxy, contract, arrangement, understanding or relationship pursuant to which such shareholder or other Nominating Person has a right to vote any shares of any security of the corporation (other than revocable proxies received pursuant to a solicitation of proxies in accordance with the Exchange Act); (C) a description of any Short Interests in any securities of the corporation directly or indirectly owned beneficially by such shareholder or other Nominating Person; (D) a description of any rights to dividends on the shares of the corporation owned beneficially by such shareholder or other Nominating Person that are separated or separable from the underlying shares of the corporation; (E) a description of any proportionate interest in shares of the corporation or Derivative Instruments held, directly or indirectly, by a general or limited partnership in which such shareholder or other Nominating Person is a general partner or, directly or indirectly, beneficially owns an interest in a general partner; (F) a description of any performance-related fees (other than an asset-based fee) to which such shareholder or other Nominating Person is entitled based on any increase or decrease in the value of shares of the corporation or Derivative Instruments, if any, as of the date of such notice, including, without limitation, any such interests held by members of such shareholder's or other Nominating Person's immediate family sharing the same household; (G) a description of any significant equity interests or any Derivative Instruments or Short Interests in any principal competitor of the corporation held by such shareholder or other Nominating Person; and (H) a description of any direct or indirect interest of such shareholder or other Nominating Person in any contract with the corporation, any affiliate of the corporation or any principal competitor of the corporation (including, in any such case, any employment agreement, collective bargaining agreement or consulting agreement), (v) a description of all arrangements or understandings between the shareholder

or other Nominating Person and each nominee and any other person or persons (naming such person or persons) pursuant to which the nomination or nominations are to be made by the shareholder, (vi) a description of all direct and indirect compensation and other material monetary agreements, arrangements and understandings during the past three years, and any other material relationships, between or among such shareholder and any other Nominating Person, on the one hand, and each nominee, and his, her or its respective affiliates and associates, or others acting in concert therewith, on the other hand, including, without limitation all information that would be required to be disclosed pursuant to Rule 404 promulgated under Regulation S-K if the shareholder and any Nominating Person, if any, or any affiliate or associate thereof or person acting in concert therewith, were the “registrant” for purposes of such rule and the nominee were a director or executive officer of such registrant, and (vii) such other information regarding each nominee as would be required to be included in a proxy statement filed pursuant to the proxy rules of the Securities and Exchange Commission (“SEC”), had the nominee been nominated, or intended to be nominated, by the Board, and (b) the signed consent of each nominee to serve as a director of the corporation if so elected. In no event shall the public announcement of an adjournment or postponement of an annual meeting commence a new time period (or extend any time period) for the giving of a shareholder’s notice as described above. Notwithstanding the second sentence of this Section 3.16.2, in the event that the number of directors to be elected at an annual meeting is increased and there is no public announcement by the corporation naming the nominees for the additional directorships at least on hundred (100) days prior to the one-year anniversary of the date of the corporation’s proxy statement released to shareholders in connection with the previous year’s annual meeting, a shareholder’s notice required by this Section 3.16.2 shall also be considered timely, but only with respect to nominees for the additional directorships, if it shall be delivered to the Secretary at the principal executive offices of the corporation not later than the close of business on the tenth (10th) day following the day on which such public announcement is first made by the corporation.

3.16.3 Nominations at Special Meetings. Nominations of persons for election to the Board may be made at a special meeting of shareholders at which directors are to be elected pursuant to the corporation’s notice of meeting (a) by or at the direction of the Board or a committee thereof or (b) provided that the Board has determined that directors shall be elected at such special meeting, by any shareholder who is a shareholder of record both at the time the notice required by Section 3.16.2 is delivered to and received by the Secretary and at the time of the special meeting, who is entitled to vote at the special meeting and in such election of directors and who complies with the notice procedures set forth in this Section 3.16. Nominations by shareholders may be made at such a special meeting of shareholders if the shareholder’s notice as required by Section 3.16.2 is delivered to the Secretary at the principal executive offices of the corporation not earlier than sixty (60) days prior to such special meeting and not later than the close of business on the later of the twentieth (20th) day prior to such special meeting or the tenth (10th) day following the day on which public announcement is first made of the date of the special meeting and of the nominees proposed by the Board to be elected at such meeting. In no event shall the public announcement of an adjournment or postponement of a special meeting commence a new time period (or extend any time period) for the giving of a shareholder’s notice as described above.

3.16.4 Definitions. For purposes of these Bylaws, “**public announcement**” shall mean disclosure in a press release reported by the Dow Jones News Service, Associated Press or comparable national news service or in a document publicly filed or furnished by the corporation with the SEC pursuant to Section 13, 14 or 15(d) of the Exchange Act. For purposes of this Section 3.16, the term “**associate**” shall have the meaning set forth in Rule 14a-1(a) under the Exchange Act and shares shall be treated as “**beneficially owned**” by a person if the person (a) beneficially owns such shares, directly or indirectly, for purposes of Section 13(d) of the Exchange Act and Regulations 13D and 13G thereunder, or (b) has or shares pursuant to any agreement, arrangement or understanding (whether or not in writing) (i) the right to acquire such shares (whether such right is exercisable immediately or only after the passage of time or the fulfillment of a condition or both), (ii) the right to vote such shares, alone or in concert with others, and/or (iii) investment power with respect to such shares, including the power to dispose of, or to direct the disposition of, such shares.

3.16.5 General.

(a) Only those persons who are nominated in accordance with the procedures set forth in this Section 3.16 shall be eligible for election as directors at any meeting of shareholders. The Chairperson of the Board or Secretary may, if the facts warrant, determine that a notice received by the corporation relating to a nomination proposed to be made does not satisfy the requirements of this Section 3.16 (including if the shareholder does not provide the updated information required under Section 3.16.2 to the corporation within five (5) business days following the record date for the meeting), and if it be so determined, shall so declare and any such nomination shall not be introduced at such meeting of shareholders, notwithstanding that proxies in respect of such vote may have been received. The chairperson of the meeting shall have the power and duty to determine whether a nomination brought before the meeting was made in accordance with the procedures set forth in this section, and, if any nomination is not in compliance with this section (including if the shareholder does not provide the updated information required under Section 3.16.2 to the corporation within five (5) business days following the record date for the meeting), to declare that such defective nomination shall be disregarded, notwithstanding that proxies in respect of such vote may have been received. Unless otherwise required by law, if the shareholder (or a qualified representative of the shareholder) does not appear at the annual meeting or a special meeting of shareholders of the corporation to present a nomination, such nomination shall be disregarded, notwithstanding that proxies in respect of such vote may have been received by the corporation. For purposes of this Section 3.16, to be considered a qualified representative of the shareholder, a person must be a duly authorized officer, manager or partner of such shareholder or authorized by a writing executed by such shareholder (or a reliable reproduction or electronic transmission of the writing) delivered to the corporation prior to the making of such nomination at such meeting by such shareholder stating that such person is authorized to act for such shareholder as proxy at the meeting of shareholders.

(b) Notwithstanding the foregoing provisions of this Section 3.16, a shareholder shall also comply with all applicable requirements of the Exchange Act and the rules and regulations thereunder with respect to the matters set forth in this Section 3.16; *provided, however*, that any references in this Section 3.16 to the Exchange Act or the rules promulgated thereunder are not intended to and shall not limit any requirements applicable to nominations to be considered pursuant to this Section 3.16. Nothing in this Section 3.16 shall be deemed to affect any rights of the holders of any series of preferred stock if and to the extent provided for under law, the Articles of Incorporation or these Bylaws.

ARTICLE IV **OFFICERS**

4.1 APPOINTMENT

The officers of the corporation shall be appointed annually by the Board 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 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 and until his or her successor is appointed and qualified.

4.2 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.

4.3 OFFICERS ENUMERATED

Except as otherwise provided by resolution of the Board, the officers of the corporation and their respective powers and duties shall be as follows:

4.3.1 Chairperson of the Board. The Chairperson 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 and in any employment agreement. The Chairperson of the Board shall preside at all meetings of the shareholders and at all meetings of the Board at which he or she is present. The Chairperson of the Board may sign deeds, mortgages, bonds, contracts and other instruments, except when the signing thereof has been expressly delegated by the Board 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 Chief Executive Officer or the President dies or becomes unable to act, the Chairperson of the Board shall perform the duties of the Chief Executive Officer or the President, as applicable, except as may be limited by resolution of the Board, with all the powers of and subject to all the restrictions upon the Chief Executive Officer or the President, as applicable.

4.3.2 Chief Executive Officer. Subject to such supervisory powers as may be given by the Board to the Chairperson of the Board (if such officer be appointed), the Chief Executive Officer, subject to the control of the Board and the Executive Committee (if one be established), shall, along with the President of the corporation, supervise and control all of the assets, business and affairs of the corporation. Unless otherwise specified by the Board, the Chief Executive Officer shall be the chief operating officer of the corporation and perform the duties customarily performed by chief operating officers. The Chief Executive Officer 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 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 Chief Executive Officer shall vote the shares owned by the corporation in other corporations, domestic or foreign, unless otherwise prescribed by law or resolution of the Board. In general, the Chief Executive Officer shall perform all duties incident to the office of Chief Executive Officer and such other duties as may be prescribed by the Board from time to time. In the absence or non-existence of the Chairperson of the Board, the Chief Executive Officer shall preside over all meetings of the shareholders and over all meetings of the Board. The Chief Executive Officer shall have the authority to appoint one or more Assistant Secretaries and Assistant Treasurers, as he or she deems necessary.

4.3.3 President. Subject to such supervisory powers as may be given by the Board to the Chairperson of the Board (if such an officer be appointed), the President, subject to the control of the Board and the Executive Committee (if one be established), shall, along with the Chief Executive Officer, 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 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. 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 from time to time. The President shall have the authority to appoint one or more Assistant Secretaries and Assistant Treasurers, as he or she deems necessary.

4.3.4 Vice Presidents. If no Chairperson of the Board 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 or, if not ranked, a Vice President designated by the Board 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 chairperson of meetings of the Board unless such Vice President is a member of the Board. 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, these Bylaws, the President or the Chairperson of the Board (if one be appointed).

4.3.5 Secretary. The Secretary shall:

- (a) have responsibility for preparing minutes of meetings of the shareholders and the Board and for authenticating records of the corporation;
- (b) see that all notices are duly given in accordance with the provisions of Sections 2.3, 2.5, 3.8, 3.9 and 3.10 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, sign with the President, or other officer authorized by the President or the Board, 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.

In the absence of the Secretary, an Assistant Secretary may perform the duties of the Secretary.

4.3.6 Treasurer. The Treasurer 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.

In the absence of the Treasurer, an Assistant Treasurer may perform the duties of the Treasurer.

4.4 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 may from time to time delegate the powers and duties of such officer to any other officer or other person whom it may select.

4.5 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.

4.6 REMOVAL

Any officer or agent may be removed by the Board 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.

4.7 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 for the unexpired portion of the term or for a new term established by the Board.

4.8 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 or, to the extent provided in Sections 4.3.2 and 4.3.3 above, by the Chief Executive Officer or 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. Any officer may be assigned by the Board any additional title that the Board deems appropriate. The Board 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.

4.9 COMPENSATION

Compensation, if any, for officers and other agents and employees of the corporation shall be determined by the Board or a committee thereof, pursuant to applicable law, rule or regulation, or by the Chief Executive Officer to the extent such authority may be delegated to him or her by the Board of Directors and applicable law, rule or regulation. 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.

4.10 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 3.1 above (except for subsection (c) thereof).

ARTICLE V
CONTRACTS, CHECKS AND DRAFTS

5.1 CONTRACTS

The Board 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.

5.2 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.

5.3 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, may select.

ARTICLE VI
CAPITAL STOCK

6.1 ISSUANCE OF SHARES

No shares of the corporation shall be issued unless authorized by the Board, 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.

6.2 CERTIFICATES OF STOCK

6.2.1 Issuance of Shares. Shares of the corporation may be uncertificated, as provided under the Washington Business Corporation Act, or certificated in such form, not inconsistent with the Articles of Incorporation, as the Board may from time to time prescribe.

6.2.2 Shares Without Certificates. Within a reasonable time after the issue or transfer of shares without certificates, the corporation shall send the shareholder a record containing the information listed in Section 6.2.3(a)-(e).

6.2.3 Certificates of Stock. Certificates of stock shall be issued in numerical order, and each shareholder shall be entitled to a certificate signed by the Chief Executive Officer, 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 name of the corporation and that it is organized under the laws of the State of Washington;
- (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 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.

6.2.4 Lost, Destroyed or Mutilated Certificates. In the 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 may prescribe.

6.3 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, 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.

6.4 RESTRICTIONS ON TRANSFER

The Board 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 such restrictions are not applicable 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.

6.5 TRANSFERS

Shares of certificated stock may only be transferred by delivery of the certificates therefor, accompanied by 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. Shares of uncertificated may only be transferred by delivery of proper instructions from the registered owner thereof. In each case, the corporation may require 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, the transfer of shares of the corporation shall be made only on the stock transfer books of the corporation pursuant to authorization or document transfer made by the holder of record or by the holder's legal representative, who shall furnish proper evidence of authority to transfer, or by the holder's attorney-in-fact authorized by power of attorney duly executed. 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 as provided in Section 6.2.4.

ARTICLE VII **RECORDS OF CORPORATE MEETINGS**

The corporation shall keep, as permanent records, minutes of all meetings of its shareholders and Board, including committee minutes, a record of all actions taken by the shareholders or Board without a meeting, and a record of all actions taken by a committee of the Board exercising the authority of the Board 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 or shareholders when certified by the President or Secretary.

ARTICLE VIII
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 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.

ARTICLE IX
CORPORATE SEAL

The Board may adopt a corporate seal for the corporation in such form and with such inscription as the Board may determine. The application or failure to apply such seal to any document or instrument will have no effect upon the validity or invalidity of such document or instrument under otherwise applicable principles of law.

ARTICLE X
GENERAL PROVISIONS

10.1 COMMUNICATIONS BY FACSIMILE

Without limiting the manner by which notice may otherwise validly be given in accordance with the Washington Business Corporation Act, 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. Such communication shall be deemed to have been received by or in the possession of the addressee upon completion of the transmission.

10.2 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.

10.3 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.

10.4 TIME PERIODS

In applying any provision of these Bylaws which require that an act be done or not done a specified number of days prior to an event or that an act be done during a period of a specified number of days prior to an event, calendar days shall be used, the day of the doing of the act shall be excluded, and the day of the event shall be included.

ARTICLE XI
AMENDMENTS

Any officer of the corporation may authenticate a restatement of the Bylaws and all amendments thereto adopted in the manner provided below.

11.1 BY THE BOARD

Except as otherwise set forth in these Bylaws or the Articles of Incorporation, these Bylaws may be altered, amended or repealed and new Bylaws may be adopted by Board, except that the Board may not amend or repeal any Bylaw that the shareholders (subject to the limitation(s) of RCW 23B.02.060(4) and 23B.08.010(2)(b)) have expressly provided, in amending or repealing the Bylaw, may not be amended or repealed by the Board.

11.2 BY THE SHAREHOLDERS

Except as otherwise set forth in these Bylaws or the Articles of Incorporation, these Bylaws may be altered, amended or repealed or new Bylaws may be adopted (in each case subject to the limitation(s) of RCW 23B.02.060(4) and 23B.08.010(2)(b)) by the affirmative vote of the holders of at least a two-thirds of the voting power of all of the shares of capital stock of the corporation issued and outstanding and entitled to vote generally in any election of directors, voting together as a single class. Such vote may be held at any annual meeting of shareholders, or at any special meeting of shareholders, *provided* that notice of such alteration, amendment, repeal or adoption of new Bylaws shall have been stated in the notice of such special meeting.

* * * * *



DLA Piper LLP (US)
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June 17, 2019

Adaptive Biotechnologies Corporation
1551 Eastlake Avenue East, Suite 200
Seattle, Washington 98102

Re: Registration Statement on Form S-1 (File No. 333-231838)

Ladies and Gentlemen:

We have acted as counsel to Adaptive Biotechnologies Corporation, a Washington corporation (the "**Company**"), in connection with the Company's filing of a Registration Statement on Form S-1 under the Securities Act of 1933, as amended (the "**Securities Act**"), initially filed with the Securities and Exchange Commission (the "**Commission**") on May 30, 2019 (File No. 333-231838) (as amended, the "**Registration Statement**"), relating to the registration of the offering by the Company (the "**Offering**") of up to 12,500,000 shares (the "**Shares**") of the Company's common stock, \$0.0001 par value per share ("**Common Stock**"), including up to 1,875,000 Shares purchasable by the underwriters upon their exercise of an option granted to the underwriters by the Company.

This opinion is being furnished in accordance with the requirements of Item 16(a) of Form S-1 and Item 601(b)(5)(i) of Regulation S-K.

We have examined such instruments, documents and records as we deemed relevant and necessary for the basis of our opinion hereinafter expressed. In such examination, we have assumed the genuineness of all signatures and the authenticity of all documents submitted to us as originals and the conformity to the originals of all documents submitted to us as copies. As to matters of fact relevant to our opinion set forth below, we have relied, without independent investigation, on certificates of public officials and of officers of the Company. We express no opinion concerning any law other than the laws of the State of Washington.

On the basis of the foregoing, we are of the opinion that when the Shares are issued and paid for in accordance with the terms of the underwriting agreement, substantially in the form filed as Exhibit 1.1 to the Registration Statement, they will be validly issued, fully paid and nonassessable.

We hereby consent to the filing of this opinion as Exhibit 5.1 to the Registration Statement and to the use of our name under the caption "Legal Matters" in the prospectus included in the Registration Statement. In giving this consent, we do not admit that we are within the category of persons whose consent is required under Section 7 of the Securities Act or the rules and regulations of the Commission promulgated thereunder.

Our opinion is expressly limited to the matters set forth above, and we render no opinion, whether by implication or otherwise, as to any other matters relating to the Company, the Shares, or the Registration Statement. This opinion is rendered as of the date hereof, and we assume no obligation to advise you of any fact, circumstance, event or development that may hereafter be brought to our attention whether or not such occurrence would alter, affect or modify the opinion expressed herein.

Very truly yours,

/s/ DLA Piper LLP (US)

DLA Piper LLP (US)

Certain information has been excluded from this exhibit because it (i) is not material and (ii) would be competitively harmful if publicly disclosed.

Master Terms and Conditions of Sale

(Illumina Advantage Products)

These MASTER TERMS AND CONDITIONS OF SALE (these “**Terms**”) are entered into effective as of May 28, 2019 (the “**Effective Date**”) by and between Illumina, Inc., a Delaware corporation with a business address at 5200 Illumina Way, San Diego, California 92122 (together with its Affiliates, “**Illumina**”), and Adaptive Biotechnologies Corporation, a Washington corporation with a business address at 1551 Eastlake Avenue East, Suite 200, Seattle, Washington 98102 (together with its Affiliates, “**Adaptive**”). Illumina and Adaptive are collectively referred to as the “**Parties**”, and each individually as a “**Party**”. For purposes of these Terms, the term “**Affiliate**” means, with respect to a Party, any entity directly controlling, controlled by, or under common control with such Party, for only so long as that control exists. For purposes of this definition, “control” means (a) in the case of a corporate entity, direct ownership of at least fifty percent of the stock or shares having the right to vote (or whatever lesser percentage that is the maximum allowed to be owned by a foreign corporation in a particular jurisdiction) for the election of directors of the entity, or (b) in the case of an entity that is not a corporate entity, the possession of the power to direct, or cause the direction of, the management or policies of the entity, whether through the ownership of voting securities, by contract, or otherwise. The terms “controlling,” “controlled by”, and “under common control with” have meanings comparable to the foregoing definition of “control”.

For good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties hereby agree as follows:

1. **Definitions.** “**Advantage Consumables**” means those Consumables that are designated with the prefix “TG” in their catalogue number or product name. “**Approved**” means that a Product has, by appropriate regulatory authorities in the territory in which it is marketed, been approved, registered, licensed, cleared, certified, or otherwise determined to be able to be lawfully marketed as an IVD or Laboratory Developed Test in such territory. “**Clinical Use**” means use of the Product to perform testing of human samples and specimens (i) using [***], or (ii) using an [***], where such use is Approved by the appropriate regulatory authorities, or may otherwise be marketed under applicable law, [***] and in the case of both (i) and (ii), specifically excluding Excluded Uses. “**Collection Territory**” means the country or countries from which samples and specimens may be collected for testing by Purchaser for Clinical Use. “**Consumable(s)**” means Seller branded reagents and consumable items that are intended by Seller to be consumed through the use of Hardware. Consumables are either Advantage Consumables or Temporary Consumables. All references in these Terms to Consumables means both Advantage Consumables and Temporary Consumables unless specified otherwise. “**Consumable Kit(s)**” means individual boxes containing Advantage Consumables. “**Documentation**” means Seller’s user manual, package insert, and similar technical documentation, for the Product in effect on the date that the Product ships from Seller. Documentation may be provided with the Product at time of shipment or provided electronically from Seller. “**Excluded Use**” means any use that (a) is a use of the Consumables to perform NIPT, or (b) is a use of a Consumable as, or as a component of [***]. “**Facility**” means 1551 Eastlake Avenue East, Suite 200, Seattle, Washington 98102, or such other facility as agreed to in writing by the Parties in a mutually signed written amendment to these Terms. “**Hardware**” means Seller-branded hardware instruments, accessories, or peripherals purchased by Purchaser. “**External IVD Kit**” means a medical device that is used [***], where such use is Approved by the appropriate regulatory authorities, or may otherwise be marketed under applicable law [***]. “**NIPT**” means non-invasive prenatal testing and includes without limitation all testing of nucleic acids of fetal or placental origin present in maternal tissue (including maternal blood and blood components). “**OTS Consumables**” are comprised of the Advantage Consumables referenced at <http://www.illumina.com/IAOTS> that are generally commercialized in the Territory and subject to the maximum order quantities stated thereon. “**Product(s)**” means the Consumables acquired hereunder. “**Purchaser**” means the Adaptive entity acquiring the Product, with the intent to use the Product, from (i) Seller or (ii) Seller’s authorized distributor or reseller. “**Seller**” means the Illumina entity selling the Product. Seller is identified in the order acknowledgment. “**Specifications**” means Seller’s written technical specifications for the Consumables, or

Master Terms and Conditions of Sale (Illumina Advantage Products)

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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.

Consumable Kit, as applicable, in effect on the date that the Product ships from Seller. “**Temporary Consumables**” means those Consumables that are not designated with the pre-fix “TG” in their catalogue number or product name and that Illumina has authorized in writing for Purchaser to purchase for use under these Terms. “**Territory**” means the country or countries to which the Products are shipped, as applicable.

2. **Purchase of Product.** Purchases and sales of Products shall occur under these Terms. For each such purchase and supply, Purchaser shall issue a purchase order for the requested Product, and Seller shall confirm or reject such order within Seller’s standard purchase order review times. Once Seller provides its order confirmation to Seller, the order will be binding and subject to these Terms. Purchaser may only place orders for Products under these Terms; other products of Seller not included within the term “Products” shall be subject to different terms and conditions to be separately negotiated between the Parties.
3. **Rights to Products upon Purchase.** Subject to these Terms, Purchaser is granted a non-exclusive, non-transferable, personal, non-sublicensable right under Seller’s Core IP to use Consumables for Clinical Use (only on samples from the Collection Territory) and for research use, both only with Hardware in Purchaser’s Facility and in accordance with the Consumables’ Specifications and Documentation, excluding all Excluded Uses. Except as expressly stated in this Section, no right or license under any intellectual property rights of Seller or Seller’s Affiliates is or are granted, expressly, by implication, or by estoppel, to Purchaser and any such rights are expressly reserved to Seller and its Affiliates. Purchaser agrees that the contents of and methods of operation of the Products are proprietary to Seller and the Products contain or embody trade secrets of Seller. “**Core IP**” means the intellectual property owned or controlled by Seller and Seller’s wholly-owned Affiliates, as of the date the Product ships, that pertain to or cover aspects or features of the Product (or use thereof) that are common to the Product in all applications and all fields of use, but does not include intellectual property that pertains to or covers aspects or features of the Products (and use thereof) only with regard to specific field(s) or specific application(s).

Purchaser is solely responsible for determining whether Purchaser has all intellectual property rights that are necessary for Purchaser’s intended uses of the Product.

4. **Product Restrictions.** The conditions and restrictions found in these Terms are bargained for conditions of sale and therefore control the sale of and use of the Products by Purchaser. Consumables and Hardware were specifically designed and manufactured to operate together. Purchaser acknowledges and agrees it will only use Consumables with the Hardware. Purchaser is not granted any right under these Terms to (i) manufacture, or have manufactured, any reagent, consumable, or substitute therefor, for use in place of a Consumable or for its own use, or (ii) market or place on the market, distribute, offer to sell, or sell any kit or product, including any in-vitro diagnostic kit based on, incorporating or for use with the Products. Purchaser agrees: (i) to only use the Product in accordance with the Product’s Documentation and Specifications, including for Clinical Use, (ii) to use each Consumable only one time, and (iii) to use only Seller Consumables with Seller Hardware, and (iii) not to, nor authorize any third party to, use the Products as described in any Excluded Uses. The limitations in (i)-(ii) in the immediately preceding sentence do not apply if the Documentation or Specifications for the Product expressly state otherwise.
5. **Regulatory.** The Product is labeled with a For Research Use Only, or similar labeling statement and is not Approved for use in diagnostic procedures. Purchaser acknowledges that (i) the Product has not been Approved by the United States Food and Drug Administration (“**FDA**”) or any other regulatory entity whether foreign or domestic for any specific intended use, whether research, commercial, diagnostic, or otherwise, and (ii) Purchaser must ensure it has any regulatory clearances/approvals that are necessary for Purchaser’s intended uses of the Product. Purchaser shall promptly disclose to Seller any regulatory clearances/approvals, adverse events, or recalls related to Product. Purchaser shall comply with all applicable laws and regulations when using, maintaining, and disposing of Product. If Seller discontinues sale of any Product to Purchaser, or otherwise discontinues any Product, and Seller makes available for purchase by Purchaser a product or combination of products that is substantially equivalent as relevant to Purchaser’s use in then-current assay to the Product no longer available for purchase by Purchaser and has the required regulatory status, then Purchaser will transition to the use of that product or combination of products and cease using the applicable Product for that application; provided that (a) solely with respect to the substantially

equivalent version of [***], the purchase price charged to Purchaser for the replacement product or combination of products shall be no greater than [***]% of the list price for the discontinued Product (at the time of discontinuation) for the remainder of the Term (as defined in Section 18 below), and (b) to the extent practicable under applicable law, Seller will provide [***] notice of the discontinuation and the discontinued Product would be supplied to Purchaser for a duration adequate to demonstrate that the replacement product or combination of products is equivalent to the the discontinued Product as relevant to Purchaser's use in the then-current assay. To the extent permitted under applicable law, Seller will honor purchase orders for the Products that were accepted prior to such discontinuation.

6. **Limited Liability.** EXCEPT FOR INDEMNIFICATION OBLIGATIONS HEREUNDER, BREACHES OF CONFIDENTIALITY HEREUNDER, OR SUCH PARTY'S GROSS NEGLIGENCE OR WILLFUL MISCONDUCT, TO THE EXTENT PERMITTED BY LAW, IN NO EVENT SHALL EITHER PARTY OR SELLER'S SUPPLIERS BE LIABLE TO THE OTHER PARTY OR ANY THIRD PARTY FOR COSTS OF PROCUREMENT OF SUBSTITUTE PRODUCTS OR SERVICES, LOST PROFITS, DATA, OR BUSINESS, OR FOR ANY INDIRECT, SPECIAL, INCIDENTAL, EXEMPLARY, CONSEQUENTIAL, OR PUNITIVE DAMAGES OF ANY KIND ARISING OUT OF OR IN CONNECTION WITH, WITHOUT LIMITATION, THE SALE OF THE PRODUCT, ITS USE, PERFORMANCE, OR ANY OF THESE TERMS, HOWEVER ARISING OR CAUSED AND ON ANY THEORY OF LIABILITY (WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE).

EXCEPT FOR INDEMNIFICATION OBLIGATIONS HEREUNDER, BREACHES OF CONFIDENTIALITY HEREUNDER, OR SUCH PARTY'S GROSS NEGLIGENCE OR WILLFUL MISCONDUCT, TO THE EXTENT PERMITTED BY LAW, SELLER'S TOTAL AND CUMULATIVE LIABILITY TO PURCHASER OR ANY THIRD PARTY ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, INCLUDING WITHOUT LIMITATION, THE PRODUCT (INCLUDING USE THEREOF) AND SELLER'S PERFORMANCE, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, SHALL IN NO EVENT EXCEED THE AMOUNT PAID TO SELLER IN THE PARTICULAR ORDER THAT DIRECTLY CAUSED THE LIABILITY.

7. **Limitations on Warranties.** TO THE EXTENT PERMITTED BY LAW AND SUBJECT TO THE EXPRESS PRODUCT WARRANTY MADE IN THESE TERMS, SELLER MAKES NO (AND EXPRESSLY DISCLAIMS ALL) WARRANTIES (EXPRESS, IMPLIED, OR STATUTORY) WITH RESPECT TO THE PRODUCT, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT, OR ARISING FROM COURSE OF PERFORMANCE, DEALING, USAGE, OR TRADE. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, SELLER MAKES NO CLAIM, REPRESENTATION, OR WARRANTY OF ANY KIND AS TO THE UTILITY OF THE PRODUCT FOR PURCHASER'S INTENDED USES.
8. **Expiry Date; Single Lot Shipments; Kit Lot Testing for Advantage Consumables.** Seller shall ensure that Advantage Consumables shall have an expiry date that is no less than [***] at the time of shipment. Expiry date will be pre-printed on the Advantage Consumable packaging. Seller shall ensure each shipment of a given Advantage Consumable includes only such Advantage Consumable manufactured from the same lot. Seller shall use commercially reasonable efforts to test each component reagent supplied under these Terms that comprises a given Advantage Consumable, together with the other component reagents of that Advantage Consumable, to ensure their functionality, unless sufficient data are available to demonstrate that a given component reagent, or component reagents, if quality tested independently, does not affect performance of the Advantage Consumable. Customer may, in its discretion, perform additional quality control testing. Seller shall provide a Certificate of Analysis for each lot of Advantage Consumables sold to Purchaser.
9. **Temporary Consumables.** If Seller has an Advantage Consumable available for purchase that is intended by Seller to replace a Temporary Consumable, Seller will give notice of the availability of such Advantage Consumable. Purchaser agrees that (i) it will promptly modify or cancel existing open purchase orders as needed so as to ensure that Purchaser will no longer receive the applicable Temporary Consumable after the date that is [***] days after the date of the notice, unless Purchaser will use such Temporary Consumables only for uses permitted under these Terms, excluding Clinical Use, and (ii) Purchaser will not place additional purchase orders for the applicable Temporary Consumable for Clinical Use after receipt of such notice.

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.**

10. Product Warranty. All warranties are personal to the Purchaser and may not be transferred or assigned to a third-party, including an Affiliate of Purchaser. All warranties are facility-specific and do not transfer if the Product is moved to another facility, unless Seller conducts such move. The warranties described in these Terms exclude any stand-alone third party goods that may be acquired or used with the Products.

a. Warranty for Consumables. Seller warrants that Consumables will conform to their Specifications until the later of (i) for Advantage Consumables, [***] from the date of shipment from Seller, and for Temporary Consumables, [***] from the date of shipment from Seller, or (ii) any expiration date or the end of the shelf-life pre-printed on such Consumable by Seller, but in either event, no later than [***] from the date of shipment.

b. Exclusions from Warranty Coverage. The foregoing warranties do not apply to the extent a non-conformance is due to (i) abuse, misuse, neglect, negligence, accident, improper storage, or use contrary to the Documentation or Specifications, (ii) use that is an Excluded Use, (iii) improper handling, installation, maintenance, or repair (other than if performed by Seller's personnel), (iv) unauthorized alterations, (v) force majeure events, or (vi) use with a third party's good (unless the Product's Documentation or Specifications expressly state such third party's good is for use with the Product).

c. Procedure for Warranty Coverage. In order to be eligible for repair or replacement under this warranty Purchaser must (i) promptly contact Seller's support department to report the non-conformance, (ii) cooperate with Seller in confirming or diagnosing the non-conformance, and (iii) return the Product, transportation charges prepaid to Seller following Seller's instructions, or, if agreed by Seller and Purchaser, grant Seller's authorized repair personnel access to the Product in order to confirm the non-conformance and make repairs.

d. Sole Remedy under Warranty. Seller will, at its option, repair or replace non-conforming Product that is covered by this warranty, provided that Seller can reasonably identify and confirm such nonconformance. Seller will use commercially reasonable efforts to provide replacement Advantage Consumables in Purchaser's next scheduled shipment where single lot per shipment can be maintained. In the event replacement Consumables are included as a single lot with the next scheduled shipment, the warranty period for replacement Consumables is equal to that of the rest of the lot. In all other cases, the warranty period for repaired or replaced Consumables is [***] days from the date of shipment or the remaining period on the original Consumables warranty, whichever is later. In no event will the warranty for repaired or replaced Consumables be later than [***] from the date of shipment. The preceding states Purchaser's sole remedy and Seller's sole obligations under the warranty.

11. Indemnification.

a. Indemnification by Seller. Subject to these Terms, including without limitation, the Exclusions to Seller Indemnification Obligations (Section 11(b) below) and the Conditions to Indemnification Obligations (Section 11(d) below), Seller shall (i) defend, indemnify, and hold harmless Purchaser against any third-party claim or action alleging that the Product when used for Clinical Use on samples from the Collection Territory, or for research use, in accordance with these Terms, in accordance with the Documentation or Specifications, where such third-party claim or action could be brought without regard to any specific fields of use or specific applications, infringes the valid and enforceable intellectual property rights of a third party, and (ii) pay all settlements entered into by, and all final judgments and costs (including reasonable attorneys' fees) awarded against, Purchaser in connection with such infringement claim. If the Product or any part thereof, becomes, or in Seller's opinion may become, the subject of an infringement claim, Seller shall have the right, at its option, to (A) procure for Purchaser the right to continue using the Product, (B) modify or replace the Product with a substantially equivalent non-infringing substitute, or (C) require the return of the Product and terminate the rights, license, and any other permissions provided to Purchaser with respect the Product and refund to Purchaser the depreciated value (as shown in Purchaser's official

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Master Terms and Conditions of Sale (Illumina Advantage Products)

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.**

records) of the returned Product at the time of such return; provided that, no refund will be given for used-up or expired Consumables. This Section states the entire liability of Seller for any infringement of third party intellectual property rights.

b. Exclusions to Seller Indemnification Obligations. For the avoidance of doubt, Seller has no obligation to defend, indemnify, or hold harmless Purchaser for any infringement claim to the extent such infringement arises from: (i) use of the Product for any Excluded Use, (ii) use of the Product in any manner not in accordance with the rights expressly granted to Purchaser under these Terms, (iii) use of the Product in combination with any third party products, materials, or services (unless the Product's Documentation or Specifications expressly state such third party's good is for use with the Product), (iv) use of the Product to perform any assay or other process not supplied by Seller (v) Seller's compliance with specifications or instructions for such Product furnished by, or on behalf of, Purchaser, (vi) Purchaser's breach of any of these Terms, or (vii) use of stand-alone third party goods that may be acquired or used with the Products (each of (i) – (vii), is referred to as an “**Excluded Claim**”).

c. Indemnification by Purchaser. Purchaser shall defend, indemnify, and hold harmless Seller, its Affiliates, their non-affiliate collaborators and development partners that contributed to the development of the Product, and their respective officers, directors, representatives, and employees against any claims, liabilities, damages, fines, penalties, causes of action, and losses of any and every kind (including reasonable attorneys fees), including without limitation, personal injury or death claims, and infringement of a third party's intellectual property rights, resulting from, relating to, or arising out of (i) any Excluded Claim, or (ii) Purchaser's marketing, sale, and/or provision of services, including without limitation, harm from misdiagnosis, missed diagnoses, and actions or inactions taken as a result of information provided directly or indirectly by Purchaser to patients, physicians, or other entities. Notwithstanding the foregoing, nothing herein shall be deemed to require Purchaser to indemnify Seller, its Affiliates, their non-affiliate collaborators and development partners that contributed to the development of the Product for the negligence or willful misconduct of any such entities.

d. Conditions to Indemnification Obligations. The Parties' indemnification obligations are conditioned upon the Party seeking indemnification (i) promptly notifying the other Party in writing of such claim or action, (ii) giving the other Party exclusive control and authority over the defense and settlement of such claim or action, (iii) not admitting infringement of any intellectual property right without prior written consent of the other Party, (iv) not entering into any settlement or compromise of any such claim or action without the other Party's prior written consent, and (v) providing reasonable assistance to the other Party in the defense of the claim or action; provided that, the indemnifying Party reimburses the indemnified Party for its reasonable out-of-pocket expenses incurred in providing such assistance.

- 12. Discontinuation/Changes to Consumable Kits.** A Consumable Kit may be phased out of production and no longer available and/or there may be a new, reconfigured, or repackaged version of a Consumable that embodies a material change to form, fit or function of such Consumable Kit with respect to its Specifications identified on Seller's certificate of analysis for such Consumable Kit (“**Changed Consumable**”). To the extent Seller is aware that Purchaser has purchased affected Consumable Kits within the [***] period prior to the Discontinuation Date or change, Seller will use commercially reasonable efforts to provide to Purchaser [***] prior notice of the discontinuation or change and will make the Changed Consumable Kits available at least [***] prior to the date that the original Consumable Kit is discontinued (“**Discontinuation Date**”). Upon Purchaser request, Seller may in good faith provide a reasonable quantity of Changed Consumable Kits free of charge to facilitate Purchaser's validation efforts in support of the change. Use of Changed Consumable Kits is subject to these Terms. Seller will use commercially reasonable efforts to honor accepted purchase orders for shipments of the original Consumable Kits, provided (i) orders are placed prior to or on the Discontinuation Date, and (ii) such shipments are scheduled no later than [***] days after the Discontinuation Date.

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.**

13. **Payment Terms.** Seller will invoice upon shipment. Subject to Seller's credit review of Purchaser (following which Seller shall inform Purchaser of applicable payment terms), all payments are due within [***] days of Purchaser's receipt of an invoice, except that payments in Japan are due within [***] days of Purchaser's receipt of an invoice. All amounts due shall be paid in U.S. dollars, unless otherwise agreed to in writing by the Parties. If payment is made by wire or other electronic funds transfer, Purchaser is solely responsible for any bank or other fees charged, and will reimburse Seller for any such fees. If any payment is not made on undisputed invoices by the due date Seller may exercise all rights and remedies available by law. Purchaser shall pay for all costs (including reasonable attorneys' fees) incurred by Seller in connection with the collection of late payments to the extent the outstanding amount was undisputed and actually remained unpaid. Each purchase order is a separate, independent transaction, and Purchaser has no right of set-off against other purchase orders or other transactions with Seller. Any undisputed amounts not paid when due will accrue interest at the rate of [***]% per month, or the maximum amount allowed by law, if lower. The Parties shall resolve all disputed invoices in good faith, including without limitation escalating any issues regarding disputed invoices to senior management who have the authority to resolve such disputes.
14. **Lead Time; Shipping Schedule and Terms; Title and Risk of Loss.** Subject to these Terms, if a purchase order for Advantage Consumables is submitted (i) by the fifth business day of the calendar month, the first shipment of Advantage Consumables on the purchase order will be no earlier than [***] days from the date the purchase order is accepted by Seller, and (ii) after the fifth business day of the calendar month, the first shipment of Advantage Consumables on the purchase order will, unless otherwise agreed by Seller and Purchaser, be no later than [***] days from the date the purchase order is accepted by Seller ("**Lead Time Requirement**"). Notwithstanding the foregoing, the Lead Time Requirement shall not apply to OTS Consumables. Each purchase order for Consumables must include a ship schedule, to be agreed to between Seller and Purchaser prior to Seller accepting that purchase order, that details the quantity of and type of Consumables (on a Consumable-by-Consumable basis) that Purchaser requires to be delivered in each calendar month that is covered by the purchase order. Unless otherwise set forth in writing by Seller or otherwise agreed between the Parties, all shipments are made DAP (Incoterms 2010) at the address designated by Purchaser at the time of ordering, and Purchaser is responsible for freight and insurance, which will be added to the invoice and paid by Purchaser, except that all shipments to member countries of the E.U. are made DDP (Incoterms 2010) at the address designated by Purchaser at the time of ordering. In all cases, title (except for software and third-party software) and risk of loss transfers to Purchaser when Product is made available at such address. All software is licensed and not sold and may be subject to additional terms found in the software end user license agreement.
15. **Taxes.** Purchaser agrees that any applicable sales, use, excise, VAT (value added tax), GST (goods and services tax), withholding, and other taxes will be calculated based on both the tax rates in effect on the date of invoice and the ship to address for the Product. Any amounts for tax listed on a quotation, if any, are for reference purposes only and are not binding on Seller. All prices and other amounts payable to Seller are exclusive of and are payable without deduction for any taxes, customs duties, tariffs, or charges hereafter claimed or imposed by any governmental authority upon the sale of Product, all of which will be paid by Purchaser. In the event Seller is required by law or regulation to pay any such tax, duty, or charge, such amount will be added to the purchase price or subsequently invoiced to the Purchaser. For Purchasers in New Zealand, Seller and Purchaser agree that subsection 8(4) Goods and Services Tax Act 1985, as may be amended, does not apply to the Products.
16. **Audits.** Purchaser may, at its sole expense, audit Illumina's operations that pertain to Advantage Components, upon [***] days' prior written notice, during normal business hours, and no more often than once per calendar year per site unless Purchaser reasonably determines there are quality issues that warrant additional audits based on documented information that suggests that an aspect of Seller's manufacturing or other operations relating to Advantage Components may materially impact the performance or safety of such Advantage Components ("For-Cause Audit"). Purchaser is responsible for providing its own travel and accommodations. The locations, times, dates, scope, attendees, and goals for such audits must be reasonably agreed upon in writing by the Parties prior to commencement of the audit, and any individuals or entities not covered by these Terms, but involved in such audit, shall be required to sign a mutually agreeable confidentiality agreement. Purchaser will issue, in writing, to Illumina all findings of any such audit within [***] days of the audit. If Purchaser reasonably contends that any audit

indicates that Illumina has not met its obligations under these Terms, Purchaser will provide detailed written notice to Illumina, and the Parties will then discuss the issues set forth in such notice in good faith in order to attempt to resolve such issues.

17. Confidentiality.

a. Definition. The term “**Confidential Information**” means the proprietary and confidential information disclosed by on behalf of one Party (the “**Disclosing Party**”) to the other Party (the “**Receiving Party**”) in connection with these Terms, except any portion of the information that (a) is known to the Receiving Party at the time of the disclosure, as evidenced by its written records or other competent evidence, (b) is disclosed to the Receiving Party by a third person who to the Receiving Party’s knowledge was lawfully in possession of such information and not under an obligation of nondisclosure, (c) is published or generally known to the public, either before or after the date of disclosure through no breach of this Section on the part of the Receiving Party, or (d) is developed by or for the Receiving Party without use or reliance upon the disclosing party’s Confidential Information as evidenced by the Receiving Party’s written records or other competent evidence. Confidential Information includes all information concerning the discussions and negotiations relating to, and the terms and existence of, these Terms.

b. Obligation. In the course of the performance of these Terms and orders hereunder, including potential discussions for orders and additional product to these Terms, the Disclosing Party may disclose Confidential Information to the Receiving Party. Except as permitted by these Terms, the Receiving Party shall not disclose Confidential Information received from the Disclosing Party to any third party, except to its Affiliates, employees, advisors, agents, and consultants (collectively, “**Permitted Recipients**”) who in the Receiving Party’s judgment, have a need to know such Confidential Information for the purpose of the Receiving Party’s performance of its obligations under these Terms or the enforcement of its rights under these Terms. The Receiving Party shall not, and shall ensure that its Permitted Recipients do not, use the Disclosing Party’s Confidential Information for any purpose except for the purpose of fulfilling the Receiving Party’s performance of its obligations under these Terms or the enforcement of its rights under these Terms. Notwithstanding the foregoing, nothing herein shall be construed as preventing the Receiving Party from disclosing any quotes, pricing terms, or other relevant portions of the Disclosing Party’s Confidential Information in confidence to third parties in connection with and necessary for the planning, negotiation, or implementation of any merger, acquisition, sale of a going concern, securities sale or transfer, financing transaction, corporate reorganization, or other M&A transaction, so long as such third parties are under an obligation of confidentiality and non-use at least as protective as those set forth in these Terms; provided that the Receiving Party shall be responsible for any unauthorized disclosures of such Confidential Information by such third parties.

c. Compelled Disclosure. If Confidential Information is required by law to be disclosed by the Receiving Party, to defend or prosecute litigation, or to comply with governmental regulations, Receiving Party may disclose the Confidential Information in connection thereto provided that the Receiving Party gives the Disclosing Party prompt prior written notice of such legal requirement, such that the Disclosing Party has the opportunity to apply for confidential treatment of such Confidential Information, and reasonably cooperates therewith.

d. Return or Destroy. Upon the end of the Term (as defined in Section 18 below), the Receiving Party shall, if so requested by the Disclosing Party, promptly return to the Disclosing Party or destroy the originals and all copies of any Confidential Information (including all extracts, summaries and derivatives thereof) then in the Receiving Party’s possession or under the Receiving Party’s control. Notwithstanding the foregoing, the Receiving Party may retain one copy of such Confidential Information for legal archival purposes and need not destroy automatic backups of their computer systems made in the ordinary course of business. All retained Confidential Information will remain subject to the terms of this Section 17.

e. Public Announcements. Neither Party shall make any public announcement concerning the transactions contemplated herein, or make any public statement that includes the name of the other Party or any of its Affiliates, or otherwise use the name of the other Party or any of its Affiliates in any public statement or public document without the prior written consent of the other Party, except and to the extent as may be required by law, regulation (including SEC regulation), or judicial order, in which case the Party required to make the public announcement or public statement shall use commercially reasonable efforts to obtain the approval of the other Party as to form, nature, and extent of the public announcement or public statement prior to issuing the same, unless reflective of prior public announcements previously agreed to regarding the general relationship between the parties.

f. Injunctive Relief. Each Party may suffer irreparable damage if its Confidential Information is used or disclosed to any third party in violation of this Section. In the event of any breach or threatened breach of this Section by the Receiving Party or any of its Permitted Recipients, the Disclosing Party may be entitled to equitable relief, including the granting of an injunction and specific performance, without proof of actual damages, in addition to all other remedies available to the Disclosing Party at law or in equity.

18. Term. These Terms shall commence on the Effective Date and continue for a period of three (3) years thereafter (the “**Term**”). The Parties shall in good faith discuss their intent to renew or not renew these Terms at least [***] days prior to the end of the Term. Notwithstanding the foregoing, either Party may terminate these Terms (a) immediately by providing written notice upon the other Party’s bankruptcy that is not resolved or withdrawn within [***] days of its filing, or (b) by giving to the other Party [***] days’ prior written notice after the breach of any material provision of this Agreement by the other Party if the breach is not cured within [***] days after written notice is given to the Party in default. Expiration or early termination of these Terms shall not relieve either Party of any obligations that it may have incurred prior to expiration or early termination, and all covenants and agreements contained in these Terms, which by their terms or context are intended to survive, will continue in full force and effect.

19. General.

a. Applicability of Terms and Conditions. These Terms exclusively govern the ordering, purchase, supply, and use of Product, and override any conflicting, amending, and/or additional terms contained in any purchase orders, invoices, order confirmations, or similar documents, all of which are hereby rejected and are null and void. Acceptance of a purchase order occurs when Seller provides an order confirmation. Seller’s failure to object to any such terms shall not constitute a waiver by Seller, nor constitute acceptance by Seller of such terms and conditions. Third party products may be subject to additional terms and conditions.

b. Order Changes/Cancellations. Orders for Products may not be changed or cancelled once placed, except as required in Section 9. Seller reserves the right to charge Purchaser up to [***]% of the purchase price of the canceled order for such Advantage Consumables, and Purchaser agrees to make payment on any and all invoices provided by Seller for such charges.

c. Governing Law. These Terms, their interpretation, and the performance of the Parties shall be governed by the laws of the State of California, U.S.A., without giving effect to its choice of law principles. Seller and Purchaser agree that the United Nations Convention on Contracts for the International Sale of Goods shall not apply to these Terms, including any terms in the Documentation.

d. Dispute Resolution. The Parties will use reasonable efforts to settle all matters in dispute between them amicably. If a dispute or claim arises out of or is related to these Terms, or the breach, termination, or invalidity thereof, the Parties agree first to try in good faith to settle the dispute by escalation to senior management in their respective organizations before resorting to litigation. Any dispute or claim arising out of or in relation to Terms, or the breach, termination, or invalidity thereof, that cannot be so resolved shall be settled exclusively by a State or

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.**

Federal court of competent jurisdiction located within San Diego County, California, U.S.A., including any appellate courts with jurisdiction over such courts, and each Party irrevocably submits to the exclusive jurisdiction and venue of any such court to resolve any such dispute or claim.

e. Representations and Warranties. Purchaser is not an authorized dealer, representative, reseller, or distributor of any of Seller's, or Seller's Affiliates', products or services. Purchaser represents, and warrants that it (i) is not purchasing the Product on behalf of a third party, (ii) is not purchasing the Product in order to resell or distribute the Product to a third party, (iii) is not purchasing the Product in order to export the Product from the country in which Seller shipped the Product pursuant to the ship-to address designated by Purchaser at the time of ordering ("**Ship-To Country**"), and (iv) will not export the Product out of the Ship-To Country.

f. Remedies for Breach. In addition to any remedies specified elsewhere under these Terms, and any remedies available to a Party under law or in equity, in the event the other Party breaches these Terms, a Party may do any, all, or any combination of the following: (i) cease further shipments of Product, (ii) terminate the rights granted to Purchaser pursuant to Section 3 (Rights to Product Upon Purchase), (iii) terminate any remaining product warranty for the affected Product, (iv) require Purchaser to immediately pay any unpaid and undisputed invoices, or (v) place a final order to cover transition (which shall be fulfilled by Seller in accordance with these terms, to the extent supply is available for Purchaser), and terminate these Terms.

g. Future Products. Any future products and/or services ("**Unreleased Products**") are subject to new part numbers, pricing, and specifications and the acquisition of Product hereunder is not in reliance on the availability of any Unreleased Products.

h. Seller Affiliates. Any actions or rights that may be performed or exercised by Seller may be performed or exercised by Seller itself or by any of its Affiliates. By way of non-limiting example, Seller's Affiliates may carry out shipment, servicing, invoicing, and receipt of payment.

i. Force Majeure. Seller is not responsible for any failure to perform or delay attributable in whole or in part to any cause beyond its reasonable control, including but not limited to acts of God, fire, flood, tornado, earthquake, hurricane, lightning, government actions, actual or threatened acts of war, terrorism, civil disturbance or insurrection, sabotage, labor shortages or disputes, failure or delay in delivery by Seller's suppliers or subcontractors, transportation difficulties, shortage of energy, raw materials or equipment, or Purchaser's fault or negligence.

j. Notices. Any notice required or permitted shall be in writing and shall be deemed received (i) when delivered personally; (ii) five days after having been sent by registered or certified mail, return receipt requested, postage prepaid (or 10 days for international mail); or (iii) one day after deposit with a commercial express courier that provides written verification of receipt.

k. Seller Information. Seller may maintain and use a database of orders and account information pertaining to Purchaser for purposes of order processing, maintaining records, assisting with future orders of Purchaser, and compliance with applicable laws and regulations. Purchaser grants to Seller a non-exclusive, fully paid-up, royalty-free, worldwide, irrevocable, perpetual right and license, with the right to sublicense, to use and commercialize in any manner suggestions, ideas, or comments provided by Purchaser to Seller related to the manufacture, use or sale of the Products.

l. Export Compliance. The Products, any related technology, or information provided to Purchaser may be subject to restrictions and controls imposed by applicable laws, the United States Export Administration Act and the regulations thereunder (or the export regulations and laws of another country). Notwithstanding anything to the contrary in these Terms, Purchaser agrees not to use the Products in, or export or re-export the Products, any related technology, or information provided to Purchaser into, any country or to any person or entity, or in any manner, in violation of such controls or any other laws, rules, or regulations of any country, state, or jurisdiction.

m. Healthcare Law Compliance. Purchaser acknowledges and agrees that as a healthcare company, Seller, and Seller's Affiliates, may be required by applicable law and regulation ("**Healthcare Laws**") to disclose the existence of these Terms, the terms of herein including financial terms, and the subject matter. Seller agrees it, and its Affiliates, will disclose, as determined in its reasonable discretion, the least amount of information as possible in order to comply with such Healthcare Laws.

n. Assignment. Neither Party may assign these Terms or any part of these Terms without the prior written consent of the other Party; provided, however: (a) either Party may assign these Terms to one of its Affiliates that is not a direct competitor of the other Party without such consent; and (b) either Party, without such consent, may assign these Terms in connection with the transfer, sale, or divestiture of substantially all of its business to which these Terms pertains or in the event of its merger or consolidation with another company that is not a direct competitor of the other Party. Any permitted assignee shall assume all obligations of its assignor under this Agreement. No assignment shall relieve any Party of its responsibility hereunder.

o. Miscellaneous. Except as expressly stated in these Terms, no right or license under any of Seller, or Seller's affiliates, intellectual property rights is or are granted expressly, by implication, or by estoppel. All references to days mean calendar days unless specifically stated otherwise. Seller may cease performance (including cancellation of any order outstanding) immediately without liability to Purchaser if Purchaser becomes the subject of a voluntary or involuntary petition in bankruptcy or any proceeding relating to insolvency, receivership, liquidation, or composition for the benefit of creditors. These Terms represent the entire agreement between the Parties regarding the subject matter hereof and supersede all prior discussions, communications, agreements, and understandings of any kind between the Parties. No amendment to these terms or waiver of any right, condition, or breach will be effective unless made in a writing signed by both Parties. If any provision is held invalid or unenforceable, such provision shall be enforced to the maximum extent permissible so as to give effect to the intent of the Parties, and the remaining terms will continue in full force and effect. The failure of either Party to exercise any right granted herein or to require any performance of any term or the waiver by either Party of any breach shall not prevent a subsequent exercise or enforcement of, or be deemed a waiver of any subsequent breach of, the same or any other term. Nothing herein shall constitute or create a joint venture, partnership, or any other similar arrangement between the Parties. There are no third party beneficiaries to these Terms.

p. Counterparts; Transmission. These Terms may be executed and transmitted by DocuSign or via email in Portable Document Format (PDF), and in any number of counterparts, each of which will be deemed to be an original, and all of which taken together will constitute one agreement binding on both Parties.

IN WITNESS WHEREOF, the Parties have caused the execution of these Terms by their respective authorized representatives, effective as of the Effective Date.

ILLUMINA, INC.

By: /s/ David Daly
Name: David Daly
Title: Sr. Vice President & General Manager
Date: 5/28/19

ADAPTIVE BIOTECHNOLOGIES CORPORATION

By: /s/ Chad Robins
Name: Chad Robins
Title: CEO
Date: 5/29/2019

ADAPTIVE BIOTECHNOLOGIES CORPORATION

OUTSIDE DIRECTOR COMPENSATION POLICY

Adopted and approved June 10, 2019

Adaptive Biotechnologies Corporation, a Washington corporation (the “**Company**”), believes that the granting of cash and equity compensation to the members of its Board of Directors (the “**Board**,” and members of the Board, the “**Directors**”) represents an effective tool to attract, retain and reward Directors who are not employees of the Company (the “**Outside Directors**”). This Outside Director Compensation Policy (this “**Policy**”) is intended to formalize the Company’s policy regarding cash compensation and grants of equity to its Outside Directors. Unless otherwise defined herein, capitalized terms used in this Policy will have the meaning given such term in the Company’s 2019 Equity Incentive Plan (the “**Plan**”). Each Outside Director will be solely responsible for any tax obligations incurred by such Outside Director as a result of the cash payments paid and equity awards granted to such Outside Director under this Policy.

This Policy will become effective upon the closing of the initial public offering of the Company’s common stock (the date of such closing, the “**Effective Date**”).

1. ANNUAL CASH COMPENSATION

Annual Cash Retainer

Each Outside Director will be paid an annual cash retainer of \$40,000. There are no per-meeting attendance fees for attending Board or shareholder meetings.

Additional Chair and Lead Director Annual Cash Retainer

Each Outside Director who serves as a lead director or chairman of a committee of the Board will be paid additional annual cash fees as follows:

Lead Independent Director:	\$35,000
Audit Committee Chair:	\$20,000
Compensation Committee Chair:	\$15,000
Nominating and Corporate Governance Committee Chair:	\$10,000

All cash compensation will be paid quarterly in arrears.

The Board in its discretion may change and otherwise revise the terms of the cash compensation granted under this Policy, including, without limitation, the amount of cash compensation to be paid, on or after the date the Board determines to make any such change or revision.

2. EQUITY COMPENSATION

Outside Directors will be entitled to receive all types of Awards (excluding Incentive Stock Options) under the Plan (or the applicable equity plan in place at the time of grant). All grants of Awards to Outside Directors pursuant to Section 2 of this Policy will be automatic and nondiscretionary, except as otherwise provided herein, and will be made in accordance with the following provisions and subject to Sections 4.5 and 13 of the Plan:

- a. Initial Award. Each individual who first becomes an Outside Director following the Effective Date will automatically be granted an Award (the “**Initial Award**”), which grant will be effective on the date on which such individual first becomes an Outside Director, whether through election by the shareholders of the Company or appointment by the Board to fill a vacancy. The Initial Award will have an estimated fair value of \$340,000 using a Black-Scholes option-pricing model (using assumptions consistent with those in the Company’s financial statements), rounded down to the nearest whole share. The Initial Award will be comprised solely of Nonstatutory Stock Options.
- b. Annual Award. Each Outside Director will be automatically granted an Award (an “**Annual Award**”), effective on the date of the first Board meeting of each calendar year, beginning with 2020, following the election or appointment of such Outside Director to the Board; provided that any Outside Director who is not continuing as a Director during the calendar year following such Board meeting will not receive an Annual Award with respect to such meeting. The Annual Award will have an estimated fair value of \$170,000 using a Black-Scholes option-pricing model (using assumptions consistent with those in the Company’s financial statements), rounded down to the nearest whole share. The Annual Award will be comprised solely of Nonstatutory Stock Options.
- c. Vesting. Subject to Sections 2(d) and 5 below, each: (a) Initial Award will vest over four (4) years, with 25% vesting on the one (1)-year anniversary of the vesting commencement date and monthly thereafter for thirty-six (36) months; and (b) Annual Award will vest monthly over one (1) year following the vesting commencement date; provided, that in each case the Outside Director continues to provide Service through each applicable vesting date.
- d. Change in Control. In the event of a Change in Control, each Outside Director will fully vest in his or her Initial Award and/or each Annual Award provided that the Outside Director continues to provide Service through such date.

3. TRAVEL EXPENSES

Each Outside Director’s reasonable, customary and documented travel expenses to Board meetings will be reimbursed by the Company.

4. ADDITIONAL PROVISIONS

All provisions of the Plan not inconsistent with this Policy will apply to Awards granted to Outside Directors.

5. ADJUSTMENTS

In the event that any dividend or other distribution (whether in the form of cash, Stock, other securities or other property), recapitalization, stock split, reverse stock split, reorganization, merger, consolidation, split-up, spin-off, combination, repurchase, or exchange of Stock or other securities of the Company or other change in the corporate structure of the Company affecting the Stock occurs, the Board, in order to prevent diminution or enlargement of the benefits or potential benefits intended to be made available under this Policy, will adjust the number of shares of Stock issuable pursuant to Awards granted under this Policy.

6. LIMITATIONS

No Outside Director may be issued in any fiscal year cash payments (including the fees under Section 1 above) and Awards (including Awards under Section 2 above) with aggregate value greater than \$600,000, increased to \$750,000 in the fiscal year of his or her initial service as an Outside Director. Any Awards or other compensation granted to an individual for his or her services as an employee, or for his or her services as a consultant other than an Outside Director, will be excluded for purposes of the limitations under this Section 6.

7. SECTION 409A

In no event will cash compensation or expense reimbursement payments under this Policy be paid after the later of (a) the fifteenth (15th) day of the third (3rd) month following the end of the Company’s fiscal year in which the compensation is earned or expenses are incurred, as applicable, or (b) the fifteenth (15th) day of the third (3rd) month following the end of the calendar year in which the compensation is earned or expenses are incurred, as applicable, in compliance with the “short-term deferral” exception under Section 409A of the Internal Revenue Code of 1986, as amended, and the final regulations and guidance thereunder, as may be amended from time to time (together, “**Section 409A**”). It is the intent of this Policy that this Policy and all payments hereunder be exempt from or otherwise comply with the requirements of Section 409A so that none of the compensation to be provided hereunder will be subject to the additional tax imposed under Section 409A, and any ambiguities or ambiguous terms herein will be interpreted to be so exempt or comply. In no event will the Company reimburse an Outside Director for any taxes imposed or other costs incurred as a result of Section 409A.

8. REVISIONS

The Board or any committee designated by the Board may amend, alter, suspend or terminate this Policy at any time and for any reason. No amendment, alteration, suspension or termination of this Policy will materially impair the rights of an Outside Director with respect to compensation that already has been paid or awarded, unless otherwise mutually agreed between the Outside Director and the Company. Termination of this Policy will not affect the Board's or the Compensation Committee's ability to exercise the powers granted to it under the Plan with respect to Awards granted under the Plan pursuant to this Policy prior to the date of such termination.

ADAPTIVE BIOTECHNOLOGIES CORPORATION

2019 EQUITY INCENTIVE PLAN

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Adaptive Biotechnologies Corporation
2019 Equity Incentive Plan

1. ESTABLISHMENT, PURPOSE AND TERM OF PLAN.

1.1 **Establishment.** The Adaptive Biotechnologies Corporation 2019 Equity Incentive Plan (the “**Plan**”) is hereby established effective as of June 13, 2019, the date of its approval by the shareholders 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 shareholders 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 Awards, 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) a parent entity, other than a Parent Corporation, that directly, or indirectly through one or more intermediary entities, controls the Company or (ii) a subsidiary 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 terms “parent,” “subsidiary,” “control” and “controlled by” shall have the meanings assigned such terms for the purposes of registration of securities 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 applicable to an Award.

(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) “**Cashless Exercise**” means a Cashless Exercise as defined in Section 6.3(b)(i).

(g) “**Cause**” means, unless such term or an equivalent term is otherwise defined by the applicable Award Agreement or other written agreement between a Participant and a Participating Company applicable to an Award, 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.

(h) “**Change in Control**” means the occurrence of any one or a combination 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 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 shareholders 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 shareholders 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(dd)(iii), the entity to which the assets of the Company were transferred (the “**Transferee**”), as the case may be; or

(iii) a date specified by the Committee following approval by the shareholders of a plan of complete 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(h) 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 events described in subsections (i), (ii) and (iii) of this Section 2.1(h) are related and to be treated in the aggregate as a single Change in Control, and its determination shall be final, binding and conclusive.

(i) “**Code**” means the Internal Revenue Code of 1986, as amended, and any applicable regulations and administrative guidelines promulgated thereunder.

(j) “**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.

(k) “**Company**” means Adaptive Biotechnologies Corporation, a Washington corporation, and any successor corporation thereto.

(l) “**Consultant**” means a person engaged to provide consulting or advisory services (other than as an Employee or a Director) 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.

(m) “**Director**” means a member of the Board.

(n) “**Disability**” means, unless such term or an equivalent term is otherwise defined by the applicable Award Agreement or other written agreement between the Participant and a Participating Company applicable to an Award, the permanent and total disability of the Participant, within the meaning of Section 22(e)(3) of the Code.

(o) “**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.

(p) “**Employee**” means any person treated as an employee (including an Officer or a Director 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 Director 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.

(q) “**Exchange Act**” means the Securities Exchange Act of 1934, as amended.

(r) “**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 of a share of Stock 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 also determine the Fair Market Value upon the average selling price of the Stock during a specified period that is within thirty (30) days before or thirty (30) days after such date, provided that, with respect to the grant of an Option or SAR, the commitment to grant such Award based on such valuation method must be irrevocable before the beginning of the specified period. 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.

(s) “**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.

(t) “**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.

(u) “**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 excluding a director who was elected or nominated in connection with an actual or threatened proxy contest relating to the election of directors of the Company).

(v) “**Insider**” means an Officer, a Director or other person whose transactions in Stock are subject to Section 16 of the Exchange Act.

(w) “**Net Exercise**” means a Net Exercise as defined in Section 6.3(b)(iii).

(x) “**Nonemployee Director**” means a Director who is not an Employee.

(y) “**Nonemployee Director Award**” means any Award granted to a Nonemployee Director.

(z) “**Nonstatutory Stock Option**” means an Option not intended to be (as set forth in the Award Agreement) or which does not qualify as an incentive stock option within the meaning of Section 422(b) of the Code.

(aa) “**Officer**” means any person designated by the Board as an officer of the Company.

(bb) “**Option**” means an Incentive Stock Option or a Nonstatutory Stock Option granted pursuant to the Plan.

- (cc) **“Other Stock-Based Award”** means an Award denominated in shares of Stock and granted pursuant to Section 11.
- (dd) **“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 shareholders of the Company of securities of the Company representing more than fifty percent (50%) of the total combined voting power of the Company’s then outstanding securities entitled to vote generally in the election of Directors; (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).
- (ee) **“Parent Corporation”** means any present or future “parent corporation” of the Company, as defined in Section 424(e) of the Code.
- (ff) **“Participant”** means any eligible person who has been granted one or more Awards.
- (gg) **“Participating Company”** means the Company or any Parent Corporation, Subsidiary Corporation or Affiliate.
- (hh) **“Participating Company Group”** means, at any point in time, the Company and all other entities collectively which are then Participating Companies.
- (ii) **“Performance Award”** means an Award of Performance Shares or Performance Units.
- (jj) **“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 levels of attainment of the applicable Performance Goal(s) measured as of the end of the applicable Performance Period.
- (kk) **“Performance Goal”** means a performance goal established by the Committee pursuant to Section 10.3.
- (ll) **“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.
- (mm) **“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 upon attainment of applicable Performance Goal(s).
- (nn) **“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 attainment of applicable Performance Goal(s).

- (oo) “**Predecessor Plan**” means the Company’s 2009 Equity Incentive Plan, as amended.
- (pp) “**Restricted Stock Award**” means an Award of a Restricted Stock Bonus or a Restricted Stock Purchase Right.
- (qq) “**Restricted Stock Bonus**” means Stock granted to a Participant pursuant to Section 8.
- (rr) “**Restricted Stock Purchase Right**” means a right to purchase Stock granted to a Participant pursuant to Section 8.
- (ss) “**Restricted Stock Unit**” means a right granted to a Participant pursuant to Section 9 to receive on a future date or occurrence of a future event a share of Stock or cash in lieu thereof, as determined by the Committee.
- (tt) “**Rule 16b-3**” means Rule 16b-3 under the Exchange Act, as amended from time to time, or any successor rule or regulation.
- (uu) “**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 thereof.
- (vv) “**Section 409A**” means Section 409A of the Code.
- (ww) “**Section 409A Deferred Compensation**” means compensation provided pursuant to an Award that constitutes nonqualified deferred compensation within the meaning of Section 409A.
- (xx) “**Securities Act**” means the Securities Act of 1933, as amended.
- (yy) “**Service**” means a Participant’s employment or service with the Participating Company Group, whether as 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 Service or a change in the Participating Company for which the Participant renders 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 been interrupted or 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 three (3) months, then on the first (1st) day following the end of such three-month period 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 and reason for such termination.

(zz) “**Stock**” means the common stock of the Company, as adjusted from time to time in accordance with Section 4.5.

(aaa) “**Stock Tender Exercise**” means a Stock Tender Exercise as defined in Section 6.3(b)(ii).

(bbb) “**Subsidiary Corporation**” means any present or future “subsidiary corporation” of the Company, as defined in Section 424(f) of the Code.

(ccc) “**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.

(ddd) “**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.

(eee) “**Vesting Conditions**” mean those conditions established in accordance with the Plan prior to the satisfaction of which an Award or 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 or failure of a performance condition to be satisfied.

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 with 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 that is the responsibility of or that is allocated to the Company herein, provided that the Officer has apparent authority with respect to such matter, right, obligation, determination or election. To the extent permitted by applicable law, the Committee may, in its discretion, delegate to a committee comprised of one or more Officers the authority to grant one or more Awards, without further approval of the Committee, to any Employee, other than a person who, at the time of such grant, is an Insider, and to exercise such other powers under the Plan as the Committee may determine; provided, however, that (a) such Officers may not grant awards for more than 30,000 shares to any Employee in any fiscal year, (b) each such Award shall be subject to the terms and conditions of the appropriate standard form of Award Agreement approved by the Board or the Committee and shall conform to the provisions of the Plan, and (c) each such Award shall conform to such other limits and guidelines as may be established from time to time by the Committee.

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 expiration of any Award, (vii) the effect of any 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, other property 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 of, or to accommodate the tax policy, accounting principles or custom of, foreign jurisdictions whose residents 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. The Committee shall have the authority, without additional approval by the shareholders of the Company, to 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 therefor of new Options or SARs covering the same or a different number of shares but with an exercise price per share equal to the Fair Market Value per share on the new grant date, Full Value Awards, or payments in cash, or (b) the amendment of outstanding Underwater Awards to reduce the exercise price thereof to the Fair Market Value per share on the date of amendment.

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, to the extent permitted by applicable law, 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, 4.3, 4.4 and 4.5, the maximum aggregate number of shares of Stock that may be issued under the Plan shall be equal to 15,519,170 shares, and such shares shall consist of authorized but unissued or reacquired shares of Stock or any combination thereof.

4.2 **Annual Increase in Maximum Number of Shares Issuable.** Subject to adjustment as provided in Section 4.5, the maximum aggregate number of shares of Stock that may be issued under the Plan as set forth in Section 4.1 shall be cumulatively increased on January 1, 2020 and on each subsequent January 1, by a number of shares (the "**Annual Increase**") equal to the lesser of (a) five percent (5%) of the number of shares of Stock issued and outstanding on the immediately preceding December 31, or (b) an amount determined by the Board.

4.3 **Adjustment for Unissued or Forfeited Predecessor Plan Shares.** The maximum aggregate number of shares of Stock that may be issued under the Plan as set forth in Section 4.1 shall be cumulatively increased from time to time by:

(a) the number of shares of Stock subject to that portion of any option or other award outstanding pursuant to the Predecessor Plan as of the Effective Date which, on or after the Effective Date, expires or is terminated or canceled for any reason without having been exercised or settled in full; and

(b) the number of shares of Stock acquired pursuant to the Predecessor Plan subject to forfeiture or repurchase by the Company for an amount not greater than the Participant's purchase price which, on or after the Effective Date, is so forfeited or repurchased;

provided, however, that the aggregate number of shares of Stock authorized for issuance under the Predecessor Plan that may become authorized for issuance under the Plan pursuant to this Section 4.3 shall not exceed 18,180,587 shares.

4.4 **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 or to the extent that shares are withheld or reacquired by the Company in satisfaction of tax withholding obligations pursuant to Section 16.2. 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 only by the number of shares actually issued in such payment. 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 net number of shares for which the Option is exercised.

4.5 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 regular, periodic 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, the Annual Increase, the Award limits set forth in Section 5.3 and Section 5.4, 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 the exercise or purchase price per share shall be rounded up to the nearest whole cent. In no event may the exercise or purchase price, if any, 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.

4.6 Assumption or Substitution of Awards. 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. In addition, subject to compliance with applicable laws, and listing requirements, shares available for grant under a shareholder approved plan of an acquired company (as appropriately adjusted to reflect the transaction) may be used for awards under the Plan to individuals who were not Employees or Directors of the Participating Company Group prior to the transaction and shall not reduce the number of shares otherwise available for issuance under the Plan.

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 Section 4.5, 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 33,699,757 shares, cumulatively increased on January 1, 2020 and on each subsequent January 1, by a number of shares equal to the Annual Increase determined under Section 4.2. 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, 4.3, 4.4 and 4.5.

(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 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 of the Option, shares issued pursuant to each such portion shall be separately identified.

5.4 **Nonemployee Director Award Limit.** The grant date Fair Market Value of all Awards made under the Plan and all other cash compensation paid by the Company to any Nonemployee Director in any calendar year may not exceed \$750,000 for the first year of service and \$600,000 for each year of service thereafter.

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 establish. Such Award Agreements 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 less 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 that would qualify under the provisions of Section 409A or 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, (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 and (c) no Option granted to an Employee who is a non-exempt employee for purposes of the Fair Labor Standards Act of 1938, as amended, shall be first exercisable until at least six (6) months following the date of grant of such Option (except in the event of such Employee's death, disability or retirement, upon a Change in Control, or as otherwise permitted by the Worker Economic Opportunity Act). 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) if permitted by the Committee and subject to the limitations contained in Section 6.3(b), by means of (1) a Cashless Exercise, (2) a Stock Tender Exercise or (3) a Net Exercise; (iii) by such other consideration as may be approved by the Committee from time to time to the extent permitted by applicable law, or (iv) 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) **Cashless Exercise.** A “*Cashless Exercise*” means the 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). 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.

(ii) **Stock Tender Exercise.** A “*Stock Tender Exercise*” means the delivery of a properly executed exercise notice accompanied by a Participant’s tender to the Company, or attestation to the ownership, in a form acceptable to the Company of whole shares of Stock owned by the Participant having a Fair Market Value that does not exceed the aggregate exercise price for the shares with respect to which the Option is exercised. 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, 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 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.

(iii) **Net Exercise.** A “*Net Exercise*” means the delivery of a properly executed exercise notice followed by a procedure pursuant to which (1) the Company will reduce the number of shares otherwise issuable to a Participant upon the exercise of an 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.

6.4 Effect of Termination of Service.

(a) **Option Exercisability.** Subject to earlier termination of the Option as otherwise provided by this Plan 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 (or such longer or shorter period provided by the Award Agreement) 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 (or such longer or shorter period provided by the Award Agreement) 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 (or such longer or shorter period provided by the Award Agreement) 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 (or such longer or shorter period provided by the Award Agreement) 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 establish. Such Award Agreements 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. Notwithstanding the foregoing, an SAR may be granted with an exercise price lower than the minimum exercise price set forth above if such SAR is granted pursuant to an assumption or substitution for another stock appreciation right in a manner that would qualify under the provisions of Section 409A of the Code.

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 (i) no Freestanding SAR shall be exercisable after the expiration of ten (10) years after the effective date of grant of such SAR and (ii) no Freestanding SAR granted to an Employee who is a non-exempt employee for purposes of the Fair Labor Standards Act of 1938, as amended, shall be first exercisable until at least six (6) months following the date of grant of such SAR (except in the event of such Employee's death, disability or retirement, upon a Change in Control, or as otherwise permitted by the Worker Economic Opportunity Act). Subject to the foregoing, unless otherwise specified by the Committee in the grant of a Freestanding SAR, each Freestanding SAR shall terminate ten (10) years after the effective date of grant of the SAR, unless earlier terminated in accordance with its provisions.

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 establish. Such Award Agreements 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 shareholder 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 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, and otherwise shall be paid no later than the end of the calendar year in which such dividends or distributions are paid to shareholders (or, if later, the 15th day of the third month following the date such dividends or distributions are paid to shareholders). 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 4.5, any and all new, substituted or additional securities or other property (other than regular, periodic 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 UNITS.

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 establish. Such Award Agreements 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.

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. Dividend Equivalent Rights, if any, shall be paid by crediting the Participant with a cash amount or with additional whole Restricted Stock Units as of the date of payment of such cash dividends on Stock, as determined by the Committee. The number of additional Restricted Stock Units (rounded to the nearest whole number), if any, to be 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 Restricted Stock Units previously credited to the Participant by (b) the Fair Market Value per share of Stock on such date. If so determined by the Committee and provided by the Award Agreement, such cash amount or 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 4.5, 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 regular, periodic 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 compliance with Section 409A, if applicable, 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. The Committee, in its discretion, may provide in any Award Agreement evidencing a Restricted Stock Unit Award that if the settlement date with respect to any shares issuable upon vesting of Restricted Stock Units would otherwise occur on a day on which the sale of such shares would violate the provisions of the Trading Compliance Policy, then the settlement date shall be deferred until the next trading day on which the sale of such shares would not violate the Trading Compliance Policy but in any event no later than the 15th day of the third calendar month following the year in which such Restricted Stock Units vest. 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 establish. Such Award Agreements 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 4.5, 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 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 or other criteria established by the Committee (each, a "**Performance Measure**"), subject to the following:

(a) **Performance Measures.** Performance Measures based on objective criteria shall be calculated in accordance with the Company's financial statements, or, if such measures are not reported in the Company's financial statements, they shall be calculated in accordance with generally accepted accounting principles, a method used generally in the

Company's industry, or in accordance with a methodology established by the Committee prior to the grant of the Performance Award. Performance Measures based on subjective criteria shall be determined on the basis established by the Committee in granting the Award. As specified by the Committee, Performance Measures may be calculated with respect to the Company and each Subsidiary Corporation consolidated therewith for financial reporting purposes, one or more Subsidiary Corporations or such division or other business unit of any of them selected by the Committee. Unless otherwise determined by the Committee prior to the grant of the Performance Award, the Performance Measures applicable to the Performance Award shall be calculated prior to the accrual of expense for any Performance Award for the same Performance Period and excluding the effect (whether positive or negative) on the Performance Measures of any change in accounting standards or any unusual or infrequently occurring event or transaction, 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 based upon one or more of the following, without limitation, 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 shareholder equity;
- (xviii) return on capital;
- (xix) return on assets;
- (xx) return on investment;
- (xxi) total shareholder return;
- (xxii) employee satisfaction;
- (xxiii) employee retention;
- (xxiv) market share;
- (xxv) customer satisfaction;
- (xxvi) product development;
- (xxvii) research and development expenses;
- (xxviii) completion of an identified special project;
- (xxix) completion of a joint venture or other corporate transaction; and
- (xxx) personal performance objectives established for an individual Participant or group of Participants.

(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 Performance Target level attained during the applicable Performance Period. A Performance Target may be stated as an absolute value, an increase or decrease in a 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 determine 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 to reflect such Participant's individual performance in his or her position with the Company or such other factors as the Committee may determine.

(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 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 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 the 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 either in cash or in the form of additional whole Performance Shares as of the date of payment of such cash dividends on Stock, as determined by the Committee. The number of additional Performance Shares (rounded to the nearest whole number), if any, 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, if any, shall be accumulated and paid to the extent that the related Performance Shares become nonforfeitable. 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 4.5, 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 regular, periodic 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 establish. Such Award Agreements 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. Other Stock-Based Awards may be made available as a form of payment in the settlement of other Awards or as payment in lieu of compensation to which a Participant is otherwise entitled. Other Stock-Based 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 4.5, 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 regular, periodic 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.

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.** In the event of a Change in Control, outstanding Awards shall be subject to the definitive agreement entered into by the Company in connection with the Change in Control. 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 the Change in Control, and to such extent as the Committee determines.

(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, 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 (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 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.

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(f), 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.** If 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, then, provided such election would not subject the Participant to taxation under Section 409A, 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 Tax Firm.** 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 the professional firm engaged by the Company for general tax purposes, or, if the tax firm so engaged by the Company is serving as accountant or auditor for the Acquiror, the Company will appoint a nationally recognized tax firm to make the determinations required by this Section (the “**Tax Firm**”). As soon as practicable thereafter, the Tax Firm 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 Tax Firm 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 Tax Firm such information and documents as the Tax Firm may reasonably request in order to make its required determination. The Company shall bear all fees and expenses the Tax Firm charges in connection with its 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 under the Plan 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 the 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 defined by Section 409A); (ii) the Participant's becoming "disabled" (as defined by Section 409A); (iii) the Participant's death; (iv) a time or fixed schedule that is either (A) specified by the Committee upon the grant of an Award and set forth in the Award Agreement evidencing such Award or (B) 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 of 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 defined by Section 409A).

(b) **Installment Payments.** It is the intent of this Plan that any right of a Participant to receive installment payments (within the meaning of Section 409A) shall, for all purposes of Section 409A, be treated as a right to a series of separate payments.

(c) **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 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.

(d) **Payment Upon Disability.** All distributions of Section 409A Deferred Compensation payable pursuant to Section 15.4(a)(ii) 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 of Section 409A Deferred Compensation upon becoming disabled, all such distributions shall be paid in a lump sum upon the determination that the Participant has become disabled.

(e) **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 of Section 409A Deferred Compensation 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.

(f) **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(c)), an amount or amounts equal in the aggregate to the intrinsic value of the Award at the time of the Change in Control.

(g) **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 pursuant to Section 15.4(a)(vi) 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 upon 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.

(h) **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.

(i) **No Representation Regarding Section 409A Compliance.** Notwithstanding any other provision of the Plan, the Company makes no representation that Awards shall be exempt from or comply with Section 409A. No Participating Company shall be liable for any tax, penalty or interest imposed on a Participant 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 or Directed Sale of 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 (or the maximum individual statutory withholding rates for the applicable jurisdiction if use of such rates would not result in adverse accounting consequences or cost). The Company may require a Participant to direct a broker, upon the vesting, exercise or settlement of an Award, to sell a portion of the shares subject to the Award 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 such Participating Company in cash.

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 shareholders, 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 Sections 4.2, 4.3, 4.4 and 4.5), (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 shareholders 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 have a materially adverse effect on any then outstanding Award without the consent of the Participant. Notwithstanding any other provision of the Plan or any Award Agreement 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, or any accounting restatement due to material noncompliance of the Company with any financial reporting requirements of securities laws as a result of which, and to the extent that, such reduction, cancellation, forfeiture, or recoupment is required by applicable securities laws. In addition, to the extent that claw-back or similar provisions applicable to Awards are required by applicable law, listing standards and/or policies adopted by the Company, Awards granted under the Plan shall be subject to such provisions.

(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 shareholders.

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 Shareholder. A Participant shall have no rights as a shareholder 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 4.5 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. In addition, unless a written employment agreement or other service agreement specifically references Awards, a general reference to "benefits" or a similar term in such agreement shall not be deemed to refer to Awards granted hereunder.

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 2019 Equity Incentive Plan as duly adopted by the Board on June 10, 2019.

/s/ Stacy Taylor

Stacy Taylor, Secretary

ADAPTIVE BIOTECHNOLOGIES CORPORATION

2019 EMPLOYEE STOCK PURCHASE PLAN

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Adaptive Biotechnologies Corporation
2019 Employee Stock Purchase Plan

1. ESTABLISHMENT, PURPOSE AND TERM OF PLAN.

1.1 **Establishment.** The Adaptive Biotechnologies Corporation 2019 Employee Stock Purchase Plan is hereby established effective as of the effective date of the initial registration by the Company of its Stock under Section 12 of the Securities Exchange Act of 1934, as amended (the “*Effective Date*”).

1.2 **Purpose.** The purpose of the Plan is to advance the interests of the Company and its shareholders by providing an incentive to attract, retain and reward Eligible Employees of the Participating Company Group and by motivating such persons to contribute to the growth and profitability of the Participating Company Group. The Plan provides Eligible Employees with an opportunity to acquire a proprietary interest in the Company through the purchase of Stock. The Plan is comprised of the Section 423 Plan and the Non-423 Plan. The Company intends that the Section 423 Plan qualify as an “employee stock purchase plan” under Section 423 of the Code (including any amendments or replacements of such section), and the Section 423 Plan shall be so construed. The Non-423 Plan, which is not intended to qualify as an “employee stock purchase plan” under Section 423 of the Code, is intended to provide Eligible Employees employed by Participating Companies outside the United States with an opportunity to purchase shares of Stock pursuant to the terms and conditions of the Plan but not necessarily in compliance with the requirements of Section 423 of the Code.

1.3 **Term of Plan.** The Plan shall continue in effect until its termination by the Committee.

2. DEFINITIONS AND CONSTRUCTION.

2.1 **Definitions.** Any term not expressly defined in the Plan but defined for purposes of Section 423 of the Code shall have the same definition herein. Whenever used herein, the following terms shall have their respective meanings set forth below:

(a) “**Board**” means the Board of Directors of the Company.

(b) “**Change in Control**” means the occurrence of any one or a combination 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 shareholders 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 shareholders 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(r)(iii), the entity to which the assets of the Company were transferred (the “Transferee”), as the case may be; or

(iii) a date specified by the Committee following approval by the shareholders of a plan of complete 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(b) 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 events described in subsections (i), (ii) and (iii) of this Section 2.1(b) are related and to be treated in the aggregate as a single Change in Control, and its determination shall be final, binding and conclusive.

(c) “**Code**” means the Internal Revenue Code of 1986, as amended, and any applicable regulations promulgated thereunder.

(d) “**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.

(e) “**Company**” means Adaptive Biotechnologies Corporation, a Washington corporation, or any successor corporation thereto.

(f) “**Compensation**” means, with respect to any Offering Period, regular base wages or salary, overtime payments, shift premiums and payments for paid time off, calculated before deduction of (i) any income or employment tax withholdings or (ii) any amounts deferred pursuant to Section 401(k) or Section 125 of the Code. Compensation shall be

limited to such amounts actually payable in cash or deferred during the Offering Period. Compensation shall not include (i) sign-on bonuses, annual or other incentive bonuses, commissions, profit-sharing distributions or other incentive-type payments, (ii) any contributions made by a Participating Company on the Participant's behalf to any employee benefit or welfare plan now or hereafter established (other than amounts deferred pursuant to Section 401(k) or Section 125 of the Code), (iii) payments in lieu of notice, payments pursuant to a severance agreement, termination pay, moving allowances, relocation payments, or (iv) any amounts directly or indirectly paid pursuant to the Plan or any other stock purchase, stock option or other stock-based compensation plan, or any other compensation not expressly included by this Section.

(g) “**Eligible Employee**” means an Employee who meets the requirements set forth in Section 5 for eligibility to participate in the Plan.

(h) “**Employee**” means a person treated as an employee of a Participating Company, and, with respect to the Section 423 Plan, a person who is an employee for purposes of Section 423 of the Code. A Participant shall be deemed to have ceased to be an Employee either upon an actual termination of employment or upon the corporation employing the Participant ceasing to be a Participating Company. For purposes of the Section 423 Plan, an individual shall not be deemed to have ceased to be an Employee while on any military leave, sick leave, or other bona fide leave of absence approved by the Company of ninety (90) days or less. For purposes of the Section 423 Plan, if an individual's leave of absence exceeds ninety (90) days, the individual shall be deemed to have ceased to be an Employee on the ninety-first (91st) day of such leave unless the individual's right to reemployment with the Participating Company Group is guaranteed either by statute or by contract. The foregoing rules regarding leaves of absence shall apply equally for purposes of the Non-423 Plan, except as otherwise required by applicable Local Law.

(i) “**Fair Market Value**” means, as of any date:

(i) If, on such date, the Stock is listed or quoted on a national or regional securities exchange or quotation system, 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 is 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 determined by the Committee, in its discretion.

(ii) If, on the relevant date, the Stock is not then listed on a national or regional securities exchange or quotation system, the Fair Market Value of a share of Stock shall be as determined in good faith by the Committee.

(j) “**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 excluding a director who was elected or nominated in connection with an actual or threatened proxy contest relating to the election of directors of the Company).

(k) “**Local Law**” means the applicable laws of the non-United States jurisdiction governing the participation in the Plan of an Eligible Employee.

(l) “**Non-423 Plan**” means that component of the Plan which is not intended to be an “employee stock purchase plan” under Section 423 of the Code and need not necessarily comply with the requirements of Section 423 of the Code.

(m) “**Non-United States Offering**” means either (i) an Offering under the Section 423 Plan covering Eligible Employees employed by a Participating Company outside the United States, provided that the terms of such Offering comply with the requirements of Section 423 of the Code, including such variations in terms of Purchase Rights as permitted by Section 3.4; or (ii) an Offering under the Non-423 Plan covering Eligible Employees of one or more Participating Companies outside the United States, the terms of which need not comply with the requirements of Section 423 of the Code.

(n) “**Offering**” means an offering of Stock pursuant to the Plan, as provided in Section 6.

(o) “**Offering Date**” means, for any Offering Period, the first day of such Offering Period.

(p) “**Offering Period**” means a period, established by the Committee in accordance with Section 6.1, during which an Offering is outstanding.

(q) “**Officer**” means any person designated by the Board as an officer of the Company.

(r) “**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 shareholders of the Company of securities of the Company representing more than fifty percent (50%) of the total combined voting power of the Company’s then outstanding securities entitled to vote generally in the election of Directors; (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).

(s) “**Parent Corporation**” means any present or future “parent corporation” of the Company, as defined in Section 424(e) of the Code.

(t) “**Participant**” means an Eligible Employee who has become a participant in an Offering Period in accordance with Section 7 and remains a participant in accordance with the Plan.

(u) “**Participating Company**” means the Company and any Parent Corporation or Subsidiary Corporation designated by the Committee as a corporation the

Employees of which may, if Eligible Employees, participate in the Plan. The Committee shall have the discretion to determine from time to time which Parent Corporations or Subsidiary Corporations shall be Participating Companies. The Committee shall designate from time to time and set forth in Appendix A to this Plan those Participating Companies whose Eligible Employees may participate in the Section 423 Plan and those Participating Companies whose Eligible Employees may participate in the Non-423 Plan.

(v) “**Participating Company Group**” means, at any point in time, the Company and all other corporations collectively which are then Participating Companies.

(w) “**Plan**” means this 2019 Employee Stock Purchase Plan of the Company, as amended from time to time, comprised of the Section 423 Plan and the Non-423 Plan.

(x) “**Purchase Date**” means, for any Offering Period, the last day of such Offering Period, or, if so determined by the Committee, the last day of each Purchase Period occurring within such Offering Period, on which outstanding Purchase Rights are exercised.

(y) “**Purchase Period**” means a period, established by the Committee in accordance with Section 6 and included within an Offering Period, the final date of which is a Purchase Date.

(z) “**Purchase Price**” means the price at which a share of Stock may be purchased under the Plan, as determined in accordance with Section 9.

(aa) “**Purchase Right**” means an option granted to a Participant pursuant to the Plan to purchase such shares of Stock as provided in Section 8, which the Participant may or may not exercise during the Offering Period in which such option is outstanding. Such option arises from the right of a Participant to withdraw any payroll deductions or other funds accumulated on behalf of the Participant and not previously applied to the purchase of Stock under the Plan, and to terminate participation in the Plan at any time during an Offering Period.

(bb) “**Registration Date**” means the effective date of the registration on Form S-8 of shares of Stock issuable pursuant to the Plan.

(cc) “**Section 423 Plan**” means that component of the Plan which is intended to be an “employee stock purchase plan” under Section 423 of the Code.

(dd) “**Securities Act**” means the Securities Act of 1933, as amended.

(ee) “**Stock**” means the Common Stock of the Company, as adjusted from time to time in accordance with Section 4.2 and 4.3.

(ff) “**Subscription Agreement**” means a written or electronic agreement, in such form as is specified by the Company, stating an Employee’s election to participate in the Plan and authorizing payroll deductions under the Plan from the Employee’s Compensation or other method of payment authorized by the Committee pursuant to Section 11.1(a).

(gg) “**Subscription Date**” means the last business day prior to the Offering Date of an Offering Period or such earlier date as the Company shall establish.

(hh) “**Subsidiary Corporation**” means any present or future “subsidiary corporation” of the Company, as defined in Section 424(f) of the Code.

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 form of agreement or other document employed by the Company in the administration of the Plan, or of any Purchase Right 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 the Purchase Right, unless fraudulent or made in bad faith. Subject to the provisions of the Plan, the Committee shall determine all of the relevant terms and conditions of Purchase Rights; provided, however, that all Participants granted Purchase Rights pursuant to an Offering under the Section 423 Plan shall have the same rights and privileges within the meaning of Section 423(b)(5) of the Code, other than for such variations in terms of Purchase Rights as permitted by Section 3.4. Any and all actions, decisions and determinations taken or made by the Committee in the exercise of its discretion pursuant to the Plan or any agreement thereunder (other than determining questions of interpretation pursuant to the second sentence of this Section 3.1) shall be final, binding and conclusive upon all persons having an interest therein. All expenses incurred in connection with 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 that is the responsibility of or that is allocated to the Company herein, provided that the Officer has apparent authority with respect to such matter, right, obligation, determination or election.

3.3 **Power to Adopt Sub-Plans.** The Committee shall have the power, in its discretion, to adopt one or more sub-plans of the Plan as the Committee deems necessary or desirable to comply with the laws or regulations, tax policy, accounting principles or custom of foreign jurisdictions applicable to employees of a subsidiary business entity of the Company, provided that any such sub-plan shall be within the scope of the Non-423 Plan. Any of the provisions of any such sub-plan may supersede the provisions of this Plan, other than Section 4. Except as superseded by the provisions of a sub-plan, the provisions of this Plan shall govern such sub-plan.

3.4 Power to Vary Terms with Respect to Non-U.S. Employees. In order to comply with the laws of a foreign jurisdiction, the Committee shall have the power, in its discretion and as permitted by Section 423 of the Code, to grant Purchase Rights in an Offering under the Section 423 Plan to citizens or residents of a non-U.S. jurisdiction (without regard to whether they are also citizens of the United States or resident aliens) that provide terms which are less favorable than the terms of Purchase Rights granted under the same Offering to Employees resident in the United States.

3.5 Power to Establish Separate Offerings with Varying Terms. The Committee shall have the power, in its discretion, to establish separate, simultaneous or overlapping Offerings having different terms and conditions and to designate the Participating Company or Companies that may participate in a particular Offering, provided that each Offering under the Section 423 Plan shall individually comply with the terms of the Plan and the requirements of Section 423(b)(5) of the Code that all Participants granted Purchase Rights pursuant to such Offering shall have the same rights and privileges within the meaning of such section, other than for such variations in terms of Purchase Rights as permitted by Section 3.4.

3.6 Policies and Procedures Established by the Company. Without regard to whether any Participant's Purchase Right may be considered adversely affected, the Company may, from time to time, consistent with the Plan and the requirements of Section 423 of the Code in the case of the Section 423 Plan, establish, change or terminate such rules, guidelines, policies, procedures, limitations, or adjustments as deemed advisable by the Company, in its discretion, for the proper administration of the Plan, including, without limitation, (a) a minimum payroll deduction amount required for participation in an Offering, (b) a limitation on the frequency or number of changes permitted in the rate of payroll deduction during an Offering, (c) an exchange ratio applicable to amounts withheld or paid in a currency other than United States dollars, (d) a payroll deduction greater than or less than the amount designated by a Participant in order to adjust for the Company's delay or mistake in processing a Subscription Agreement or in otherwise effecting a Participant's election under the Plan or as advisable to comply with the requirements of Section 423 of the Code, and (e) determination of the date and manner by which the Fair Market Value of a share of Stock is determined for purposes of administration of the Plan. All such actions by the Company with respect to the Section 423 Plan shall be taken consistent with the requirements under Section 423(b)(5) of the Code that all Participants granted Purchase Rights pursuant to an Offering shall have the same rights and privileges within the meaning of such section, except as otherwise permitted by Section 3.4 and the regulations under Section 423 of the Code.

3.7 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, to the extent permitted by applicable law, 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 Section 4.2 and 4.3, the maximum aggregate number of shares of Stock that may be issued under the Plan and the Section 423 Plan shall be 1,551,917 and the maximum aggregate number of shares of Stock that may be issued under the Non-423 Plan shall be 1,551,917, less the aggregate number of shares of Stock issued under the Section 423 Plan. Shares issued under the Plan shall consist of authorized but unissued or reacquired shares of Stock, or any combination thereof. If an outstanding Purchase Right for any reason expires or is terminated or canceled, the shares of Stock allocable to the unexercised portion of that Purchase Right shall again be available for issuance under the Plan.

4.2 **Annual Increase in Maximum Number of Shares Issuable.** Subject to adjustment as provided in Section 4.3, the maximum aggregate number of shares of Stock that may be issued under the Plan as set forth in Section 4.1 shall be cumulatively increased automatically on January 1, 2020 and on each subsequent January 1, by a number of shares (the “**Annual Increase**”) equal to the smallest of (a) one percent (1%) of the number of shares of Stock issued and outstanding on the immediately preceding December 31, or (b) an amount determined by the Board.

4.3 **Adjustments for Changes in Capital Structure.** Subject to any required action by the shareholders of the Company and the requirements of Section 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 regular, periodic 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, any limit on the number of shares which may be purchased by any Participant during an Offering Period or Purchase Period (as described in Sections 8.1 and 8.2), the number of shares subject to each Purchase Right, and in the Purchase Price 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 Purchase Rights 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 Purchase Rights to provide that such Purchase Rights are for New Shares. In the event of any such amendment, the

number of shares subject to, and the exercise price per share of, the outstanding Purchase Rights 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 Purchase Price be decreased to an amount less than the par value, if any, of the stock subject to the Purchase Right. The adjustments determined by the Committee pursuant to this Section 4.3 shall be final, binding and conclusive.

5. **ELIGIBILITY.**

5.1 **Employees Eligible to Participate.** Each Employee of a Participating Company is eligible to participate in the Plan and shall be deemed an Eligible Employee, except the following:

- (a) Any Employee who is customarily employed by the Participating Company Group for twenty (20) hours or less per week; or
- (b) Any Employee who is customarily employed by the Participating Company Group for not more than five (5) months in any calendar year.

An Eligible Employee shall be eligible to participate in the Section 423 Plan or the Non-423 Plan in accordance with the designation in Appendix A of the Employee's employer as either a Section 423 Plan Participating Company or a Non-423 Plan Participating Company. Notwithstanding the foregoing, an Employee of a Participating Company designated in Appendix A as a Section 423 Plan Participating Company who is a citizen or resident of a non-United States jurisdiction (without regard to whether the Employee is also a citizen of the United States or a resident alien) may be excluded from participation in the Section 423 Plan or an Offering thereunder if either (i) the grant of a Purchase Right under the Section 423 Plan or Offering to a citizen or resident of the foreign jurisdiction is prohibited under the Local Law of such jurisdiction or (ii) compliance with the Local Law of such jurisdiction would cause the Section 423 Plan or Offering to violate the requirements of Section 423 of the Code. For purposes of participation in the Non-423 Plan, Eligible Employees shall include any other Employees of the applicable Non-423 Plan Participating Company to the extent that applicable Local Law requires participation in the Plan to be extended to such Employees, as determined by the Company.

5.2 **Exclusion of Certain Shareholders.** Notwithstanding any provision of the Plan to the contrary, no Employee shall be treated as an Eligible Employee and granted a Purchase Right under the Section 423 Plan if, immediately after such grant, the Employee would own, or hold options to purchase, stock of the Company or of any Parent Corporation or Subsidiary Corporation possessing five percent (5%) or more of the total combined voting power or value of all classes of stock of such corporation, as determined in accordance with Section 423(b)(3) of the Code. For purposes of this Section 5.2, the attribution rules of Section 424(d) of the Code shall apply in determining the stock ownership of such Employee.

5.3 **Determination by Company.** 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 or an Eligible Employee and the effective date of such individual's attainment or termination of such status, as the case may be. For purposes of an individual's participation in or other rights, if any, under 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.

6. **OFFERINGS.**

6.1 **Offering Periods.** The Plan shall be implemented by sequential Offerings of approximately six (6) months' duration or such other duration as the Committee shall determine, which shall commence at such times as the Committee shall determine in its discretion. Notwithstanding the foregoing, the Committee may establish additional or alternative concurrent, sequential or overlapping Offering Periods, a different duration for one or more Offering Periods or different commencing or ending dates for such Offering Periods; provided, however, that no Offering Period may have a duration exceeding twenty-seven (27) months. If the Committee shall so determine in its discretion, each Offering Period may consist of two (2) or more consecutive Purchase Periods having such duration as the Committee shall specify, and the last day of each such Purchase Period shall be a Purchase Date. If the first or last day of an Offering Period or a Purchase Period is not a day on which the principal stock exchange or quotation system on which the Stock is then listed is open for trading, the Company shall specify the trading day that will be deemed the first or last day, as the case may be, of the Offering Period or Purchase Period.

6.2 **Non-United States Offerings.** The Committee shall communicate to the Employees eligible to participate in a Non-United States Offering (whether pursuant to the Section 423 Plan or the Non-423 Plan) those terms of the Non-United States Offering that differ from the terms otherwise applicable to the relevant Offering covering Eligible Employees employed by a Participating Company within the United States under the Section 423 Plan a reasonable period of time prior to the Subscription Date for such Non-United States Offering.

7. **PARTICIPATION IN THE PLAN.**

7.1 **Initial Participation.**

(a) **Generally.** An Eligible Employee may become a Participant in an Offering Period by delivering a properly completed written or electronic Subscription Agreement to the Company office or representative designated by the Company (including a third-party administrator designated by the Company) not later than the close of business on the Subscription Date established by the Company for that Offering Period. An Eligible Employee who does not deliver a properly completed Subscription Agreement in the manner permitted or required on or before the Subscription Date for an Offering Period shall not participate in the Plan for that Offering Period or for any subsequent Offering Period unless the Eligible Employee subsequently delivers a properly completed Subscription Agreement to the appropriate Company office or representative on or before the Subscription Date for such subsequent Offering Period. An Employee who becomes an Eligible Employee after the Offering Date of an Offering Period shall not be eligible to participate in that Offering Period but may participate in any subsequent Offering Period provided the Employee is still an Eligible Employee as of the Offering Date of such subsequent Offering Period.

7.2 Continued Participation.

(a) **Generally.** A Participant shall automatically participate in the next Offering Period commencing immediately after the final Purchase Date of each Offering Period in which the Participant participates provided that the Participant remains an Eligible Employee on the Offering Date of the new Offering Period and has not either (a) withdrawn from the Plan pursuant to Section 12.1, or (b) terminated employment or otherwise ceased to be an Eligible Employee as provided in Section 13. A Participant who may automatically participate in a subsequent Offering Period, as provided in this Section, is not required to deliver any additional Subscription Agreement for the subsequent Offering Period in order to continue participation in the Plan. However, a Participant may deliver a new Subscription Agreement for a subsequent Offering Period in accordance with the procedures set forth in Section 7.1 if the Participant desires to change any of the elections contained in the Participant's then effective Subscription Agreement.

8. RIGHT TO PURCHASE SHARES.

8.1 **Grant of Purchase Right.** Except as otherwise provided below, on the Offering Date of each Offering Period, each Participant in such Offering Period shall be granted automatically a Purchase Right consisting of an option to purchase that number of whole shares of Stock determined by dividing the Dollar Limit (determined as provided below) by the Fair Market Value of a share of Stock on such Offering Date or (b) the Share Limit (determined as provided below). The Committee may, in its discretion and prior to the Offering Date of any Offering Period, (i) change the method of, or any of the foregoing factors in, determining the number of shares of Stock subject to Purchase Rights to be granted on such Offering Date, or (ii) specify a maximum aggregate number of shares that may be purchased by all Participants in an Offering or on any Purchase Date within an Offering Period. No Purchase Right shall be granted on an Offering Date to any person who is not, on such Offering Date, an Eligible Employee. For the purposes of this Section, the "**Dollar Limit**" shall be determined by multiplying \$2,083.33 by the number of months (rounded to the nearest whole month) in the Offering Period and rounding to the nearest whole dollar, and the "**Share Limit**" shall be determined by multiplying three hundred (300) shares by the number of months (rounded to the nearest whole month) in the Offering Period and rounding to the nearest whole share.

8.2 **Calendar Year Purchase Limitation.** Notwithstanding any provision of the Plan to the contrary, no Participant (whether participating in the Section 423 Plan or the Non-423 Plan) shall be granted a Purchase Right which permits his or her right to purchase shares of Stock under the Plan to accrue at a rate which, when aggregated with such Participant's rights to purchase shares under all other employee stock purchase plans of a Participating Company intended to meet the requirements of Section 423 of the Code, exceeds Twenty-Five Thousand Dollars (\$25,000) in Fair Market Value (or such other limit, if any, as may be imposed by the Code) for each calendar year in which such Purchase Right is outstanding at any time. For purposes of the preceding sentence, the Fair Market Value of shares purchased during a given Offering Period shall be determined as of the Offering Date for such Offering Period. The limitation described in this Section shall be applied in conformance with Section 423(b)(8) of the Code or any successor thereto and the regulations thereunder.

9. **PURCHASE PRICE.**

The Purchase Price at which each share of Stock may be acquired in an Offering Period upon the exercise of all or any portion of a Purchase Right shall be established by the Committee; provided, however, that the Purchase Price on each Purchase Date shall not be less than eighty-five percent (85%) of the lesser of (a) the Fair Market Value of a share of Stock on the Offering Date of the Offering Period or (b) the Fair Market Value of a share of Stock on the Purchase Date. Subject to adjustment as provided by the Plan and unless otherwise provided by the Committee, the Purchase Price for each Offering Period shall be eighty-five percent (85%) of the lesser of (a) the Fair Market Value of a share of Stock on the Offering Date of the Offering Period or (b) the Fair Market Value of a share of Stock on the Purchase Date.

10. **ACCUMULATION OF PURCHASE PRICE THROUGH PAYROLL DEDUCTION.**

Except as provided in Section 11.1(b) with respect to a Non-United States Offering or except as otherwise provided by the Committee in connection with an Offering under the Non-423 Plan, shares of Stock acquired pursuant to the exercise of all or any portion of a Purchase Right may be paid for only by means of payroll deductions from the Participant's Compensation accumulated during the Offering Period for which such Purchase Right was granted, subject to the following:

10.1 **Amount of Payroll Deductions.** Except as otherwise provided herein, the amount to be deducted under the Plan from a Participant's Compensation on each pay day during an Offering Period shall be determined by the Participant's Subscription Agreement. The Subscription Agreement shall set forth the percentage of the Participant's Compensation to be deducted on each pay day during an Offering Period in whole percentages of not less than one percent (1%) (except as a result of an election pursuant to Section 10.3 to stop payroll deductions effective following the first pay day during an Offering) or more than fifteen percent (15%). The Committee may change the foregoing limits on payroll deductions effective as of any Offering Date.

10.2 **Commencement of Payroll Deductions.** Payroll deductions shall commence on the first pay day occurring on or following the Offering Date and shall continue to the end of the Offering Period unless sooner altered or terminated as provided herein.

10.3 **Election to Decrease or Stop Payroll Deductions.** During an Offering Period, a Participant may elect to decrease the rate of or to stop (but not to increase) deductions from his or her Compensation by delivering to the Company office or representative designated by the Company (including a third-party administrator designated by the Company) an amended Subscription Agreement authorizing such change on or before the "Change Notice Date." The "**Change Notice Date**" shall be a date prior to the beginning of the first pay period for which such election is to be effective as established by the Company from time to time and announced to the Participants. A Participant who elects, effective following the first pay day of an Offering Period, to decrease the rate of his or her payroll deductions to zero percent (0%) shall nevertheless remain a Participant in such Offering Period unless the Participant withdraws from the Plan as provided in Section 12.1.

10.4 Election to Increase Payroll Deductions for Subsequent Offering. Prior to the Offering Date of any Offering Period, an Eligible Employee may elect to increase the rate of deductions from Compensation (not in excess of the limit set forth in Section 10.1) effective with the next Offering Period by delivering to the Company office or representative designated by the Company (including a third-party administrator designated by the Company) an amended Subscription Agreement authorizing such change on or before the Change Notice Date prior to the commencement of such new Offering Period.

10.5 Administrative Suspension of Payroll Deductions. The Company may, in its discretion, suspend a Participant's payroll deductions under the Plan as the Company deems advisable to avoid accumulating payroll deductions in excess of the amount that could reasonably be anticipated to purchase the maximum number of shares of Stock permitted (a) under the Participant's Purchase Right, or (b) during a calendar year under the limit set forth in Section 8.2. Unless the Participant has either withdrawn from the Plan as provided in Section 12.1 or has ceased to be an Eligible Employee, suspended payroll deductions shall be resumed at the rate specified in the Participant's then effective Subscription Agreement either (i) at the beginning of the next Offering Period if the reason for suspension was clause (a) in the preceding sentence, or (ii) at the beginning of the next Offering Period having a first Purchase Date that falls within the subsequent calendar year if the reason for suspension was clause (b) in the preceding sentence.

10.6 Participant Accounts. Individual bookkeeping accounts shall be maintained for each Participant. All payroll deductions from a Participant's Compensation (and other amounts received from a non-United States Participant pursuant to Section 11.1(b) or pursuant to an Offering under the Non-423 Plan) shall be credited to such Participant's Plan account and shall be deposited with the general funds of the Company (except as otherwise required by Local Law in connecting with an Offering under the Non-423 Plan). All such amounts received or held by the Company may be used by the Company for any corporate purpose.

10.7 No Interest Paid. Interest shall not be paid on sums deducted from a Participant's Compensation pursuant to the Plan or otherwise credited to the Participant's Plan account (except as otherwise required by Local Law in connection with an Offering under the Non-423 Plan).

11. PURCHASE OF SHARES.

11.1 Exercise of Purchase Right.

(a) **Generally.** Except as provided in Section 11.1(b), on each Purchase Date of an Offering Period, each Participant who has not withdrawn from the Plan and whose participation in the Offering has not otherwise terminated before such Purchase Date shall automatically acquire pursuant to the exercise of the Participant's Purchase Right the number of

whole shares of Stock determined by dividing (a) the total amount of the Participant's payroll deductions accumulated in the Participant's Plan account during the Offering Period and not previously applied toward the purchase of Stock by (b) the Purchase Price. However, in no event shall the number of shares purchased by the Participant during an Offering Period exceed the number of shares subject to the Participant's Purchase Right. No shares of Stock shall be purchased on a Purchase Date on behalf of a Participant whose participation in the Offering or the Plan has terminated before such Purchase Date.

(b) Purchase by Non-United States Participants for Whom Payroll Deductions Are Prohibited by Applicable Law.

Notwithstanding Section 11.1(a), where payroll deductions on behalf of Participants who are citizens or residents of countries other than the United States (without regard to whether they are also citizens of the United States or resident aliens) are prohibited or made impracticable by applicable Local Law, the Committee may establish a separate Offering (a "*Non-United States Offering*") covering all Eligible Employees of one or more Participating Companies subject to such prohibition or restrictions on payroll deductions. The Non-United States Offering shall provide another method for payment of the Purchase Price with such terms and conditions as shall be administratively convenient and comply with applicable Local Law. On each Purchase Date of the Offering Period applicable to a Non-United States Offering, each Participant who has not withdrawn from the Plan and whose participation in such Offering Period has not otherwise terminated before such Purchase Date shall automatically acquire pursuant to the exercise of the Participant's Purchase Right a number of whole shares of Stock determined in accordance with Section 11.1(a) to the extent of the total amount of the Participant's Plan account balance accumulated during the Offering Period in accordance with the method established by the Committee and not previously applied toward the purchase of Stock. However, in no event shall the number of shares purchased by a Participant during such Offering Period exceed the number of shares subject to the Participant's Purchase Right. The Company shall refund to a Participant in a Non-United States Offering in accordance with Section 11.4 any excess Purchase Price payment received from such Participant.

11.2 Pro Rata Allocation of Shares. If the number of shares of Stock which might be purchased by all Participants on a Purchase Date exceeds the number of shares of Stock remaining available for issuance under the Plan or the maximum aggregate number of shares of Stock that may be purchased on such Purchase Date pursuant to a limit established by the Committee pursuant to Section 8.1, the Company shall make a pro rata allocation of the shares available in as uniform a manner as practicable and as the Company determines to be equitable. Any fractional share resulting from such pro rata allocation to any Participant shall be disregarded.

11.3 Delivery of Title to Shares. Subject to any governing rules or regulations, as soon as practicable after each Purchase Date, the Company shall issue or cause to be issued to or for the benefit of each Participant the shares of Stock acquired by the Participant on such Purchase Date 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.

11.4 Return of Plan Account Balance. Any cash balance remaining in a Participant's Plan account following any Purchase Date shall be refunded to the Participant as soon as practicable after such Purchase Date. However, if the cash balance to be returned to a Participant pursuant to the preceding sentence is less than the amount that would have been necessary to purchase an additional whole share of Stock on such Purchase Date, the Company may retain the cash balance in the Participant's Plan account to be applied toward the purchase of shares of Stock in the subsequent Purchase Period or Offering Period.

11.5 Tax Withholding. At the time a Participant's Purchase Right is exercised, in whole or in part, or at the time a Participant disposes of some or all of the shares of Stock he or she acquires under the Plan, the Participant shall make adequate provision for the federal, state, local and foreign taxes (including social insurance), if any, required to be withheld by any Participating Company upon exercise of the Purchase Right or upon such disposition of shares, respectively. A Participating Company may, but shall not be obligated to, withhold from the Participant's compensation the amount necessary to meet such withholding obligations. The Company or any other Participating Company shall have the right to take such other action as it determines to be necessary or advisable to satisfy withholding obligations for such taxes.

11.6 Expiration of Purchase Right. Any portion of a Participant's Purchase Right remaining unexercised after the end of the Offering Period to which the Purchase Right relates shall expire immediately upon the end of the Offering Period.

11.7 Provision of Reports and Shareholder Information to Participants. Each Participant who has exercised all or part of his or her Purchase Right shall receive, as soon as practicable after the Purchase Date, a report of such Participant's Plan account setting forth the total amount credited to his or her Plan account prior to such exercise, the number of shares of Stock purchased, the Purchase Price for such shares, the date of purchase and the cash balance, if any, remaining immediately after such purchase that is to be refunded or retained in the Participant's Plan account pursuant to Section 11.4. The report required by this Section may be delivered or made available in such form and by such means, including by electronic transmission, as the Company may determine. In addition, each Participant shall be provided information concerning the Company equivalent to that information provided generally to the Company's common shareholders.

12. WITHDRAWAL FROM PLAN.

12.1 Voluntary Withdrawal from the Plan. A Participant may withdraw from the Plan by signing and delivering to the Company office or representative designated by the Company (including a third-party administrator designated by the Company) a written or electronic notice of withdrawal on a form provided by the Company for this purpose. Such withdrawal may be elected at any time prior to the end of an Offering Period; provided, however, that if a Participant withdraws from the Plan after a Purchase Date, the withdrawal shall not affect shares of Stock acquired by the Participant on such Purchase Date. A Participant who voluntarily withdraws from the Plan is prohibited from resuming participation in the Plan in the same Offering from which he or she withdrew, but may participate in any subsequent Offering by again satisfying the requirements of Sections 5 and 7.1. The Company may impose, from time to time, a requirement that the notice of withdrawal from the Plan be on file with the Company office or representative designated by the Company for a reasonable period prior to the effectiveness of the Participant's withdrawal.

12.2 **Return of Plan Account Balance.** Upon a Participant's voluntary withdrawal from the Plan pursuant to Section 12.1, the Participant's accumulated Plan account balance which has not been applied toward the purchase of shares of Stock shall be refunded to the Participant as soon as practicable after the withdrawal, without the payment of any interest (except as otherwise required by Local Law in connection with an Offering under the Non-423 Plan), and the Participant's interest in the Plan and the Offering shall terminate. Such amounts to be refunded in accordance with this Section may not be applied to any other Offering under the Plan.

13. **TERMINATION OF EMPLOYMENT OR ELIGIBILITY.**

Upon a Participant's ceasing, prior to a Purchase Date, to be an Employee of the Participating Company Group for any reason, including retirement, disability or death, or upon the failure of a Participant to remain an Eligible Employee, the Participant's participation in the Plan shall terminate immediately. In such event, the Participant's Plan account balance which has not been applied toward the purchase of shares of Stock shall, as soon as practicable, be returned to the Participant or, in the case of the Participant's death, to the Participant's beneficiary designated in accordance with Section 20, if any, or legal representative, and all of the Participant's rights under the Plan shall terminate. Interest shall not be paid on sums returned pursuant to this Section 13 (except as otherwise required by Local Law in connection with an Offering under the Non-423 Plan). A Participant whose participation has been so terminated may again become eligible to participate in the Plan by satisfying the requirements of Sections 5 and 7.1.

14. **EFFECT OF CHANGE IN CONTROL ON PURCHASE RIGHTS.**

In the event of a Change in Control, the surviving, continuing, successor, or purchasing corporation or parent thereof, as the case may be (the "**Acquiring Corporation**"), may, without the consent of any Participant, assume or continue the Company's rights and obligations under outstanding Purchase Rights or substitute substantially equivalent purchase rights for the Acquiring Corporation's stock. If the Acquiring Corporation elects not to assume, continue or substitute for the outstanding Purchase Rights, the Purchase Date of the then current Offering Period shall be accelerated to a date before the date of the Change in Control specified by the Committee, but the number of shares of Stock subject to outstanding Purchase Rights shall not be adjusted. All Purchase Rights which are neither assumed or continued by the Acquiring Corporation in connection with the Change in Control nor exercised as of the date of the Change in Control shall terminate and cease to be outstanding effective as of the date of the Change in Control.

15. **NONTRANSFERABILITY OF PURCHASE RIGHTS.**

Neither payroll deductions or other amounts credited to a Participant's Plan account nor a Participant's Purchase Right may be assigned, transferred, pledged or otherwise disposed of in any manner other than as provided by the Plan or by will or the laws of descent

and distribution. (A beneficiary designation pursuant to Section 20 shall not be treated as a disposition for this purpose.) Any such attempted assignment, transfer, pledge or other disposition shall be without effect, except that the Company may treat such act as an election to withdraw from the Plan as provided in Section 12.1. A Purchase Right shall be exercisable during the lifetime of the Participant only by the Participant.

16. COMPLIANCE WITH APPLICABLE LAW.

The issuance of shares of Stock or other property under the Plan shall be subject to compliance with all applicable requirements of federal, state and foreign securities law and other applicable laws, rules and regulations, and approvals by government agencies as may be required or as the Company deems necessary or advisable. A Purchase Right may not be exercised if the issuance of shares upon such exercise would constitute a violation of any applicable federal, state or foreign securities laws or other law or regulations or the requirements of any securities exchange or market system upon which the Stock may then be listed. In addition, no Purchase Right may be exercised unless (a) a registration statement under the Securities Act shall at the time of exercise of the Purchase Right be in effect with respect to the shares issuable upon exercise of the Purchase Right, or (b) in the opinion of legal counsel to the Company, the shares issuable upon exercise of the Purchase Right 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 under the Plan 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 a Purchase Right, 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.

17. RIGHTS AS A SHAREHOLDER AND EMPLOYEE.

A Participant shall have no rights as a shareholder by virtue of the Participant's participation in the Plan until the date of the issuance of the shares of Stock purchased pursuant to the exercise of the Participant's Purchase Right (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 4.2 and 4.3. Nothing herein shall confer upon a Participant any right to continue in the employ of the Participating Company Group or interfere in any way with any right of any Participating Company to terminate the Participant's employment at any time.

18. NOTIFICATION OF DISPOSITION OF SHARES.

The Company may require the Participant to give the Company prompt notice of any disposition of shares of Stock acquired by exercise of a Purchase Right. The Company may require that until such time as a Participant disposes of shares of Stock acquired upon exercise of a Purchase Right, the Participant shall hold all such shares in the Participant's name until the

later of two years after the date of grant of such Purchase Right or one year after the date of exercise of such Purchase Right. The Company may direct that the certificates evidencing shares of Stock acquired by exercise of a Purchase Right refer to such requirement to give prompt notice of disposition.

19. **LEGENDS.**

The Company may at any time place legends or other identifying symbols referencing any applicable federal, state or foreign securities law restrictions or any provision convenient in the administration of the Plan on some or all of the certificates representing shares of Stock issued under the Plan. The Participant shall, at the request of the Company, promptly present to the Company any and all certificates representing shares acquired pursuant to a Purchase Right 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:

“THE SHARES EVIDENCED BY THIS CERTIFICATE WERE ISSUED BY THE CORPORATION TO THE REGISTERED HOLDER UPON THE PURCHASE OF SHARES UNDER AN EMPLOYEE STOCK PURCHASE PLAN AS DEFINED IN SECTION 423 OF THE INTERNAL REVENUE CODE OF 1986, AS AMENDED. THE TRANSFER AGENT FOR THE SHARES EVIDENCED HEREBY SHALL NOTIFY THE CORPORATION IMMEDIATELY OF ANY TRANSFER OF THE SHARES BY THE REGISTERED HOLDER HEREOF. THE REGISTERED HOLDER SHALL HOLD ALL SHARES PURCHASED UNDER THE PLAN IN THE REGISTERED HOLDER’S NAME (AND NOT IN THE NAME OF ANY NOMINEE).”

20. **DESIGNATION OF BENEFICIARY.**

20.1 **Designation Procedure.** Subject to applicable Local Law and procedures, a Participant may file a written designation of a beneficiary who is to receive (a) shares and cash, if any, from the Participant’s Plan account if the Participant dies subsequent to a Purchase Date but prior to delivery to the Participant of such shares and cash, or (b) cash, if any, from the Participant’s Plan account if the Participant dies prior to the exercise of the Participant’s Purchase Right. 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. A Participant may change his or her beneficiary designation at any time by written notice to the Company.

20.2 **Absence of Beneficiary Designation.** If a Participant dies without an effective designation pursuant to Section 20.1 of a beneficiary who is living at the time of the Participant’s death, the Company shall deliver any shares or cash credited to the Participant’s Plan account to the Participant’s legal representative or as otherwise required by applicable law.

21. **NOTICES.**

All notices or other communications by a Participant to the Company under or in connection with the Plan shall be deemed to have been duly given when received in the form specified by the Company at the location, or by the person, designated by the Company for the receipt thereof.

22. **AMENDMENT OR TERMINATION OF THE PLAN.**

The Committee may at any time amend, suspend or terminate the Plan, except that (a) no such amendment, suspension or termination shall affect Purchase Rights previously granted under the Plan unless expressly provided by the Committee, and (b) no such amendment, suspension or termination may adversely affect a Purchase Right previously granted under the Plan without the consent of the Participant, except to the extent permitted by the Plan or as may be necessary to qualify the Section 423 Plan as an employee stock purchase plan pursuant to Section 423 of the Code or to comply with any applicable law, regulation or rule. In addition, an amendment to the Plan must be approved by the shareholders of the Company within twelve (12) months of the adoption of such amendment if such amendment would authorize the sale of more shares than are then authorized for issuance under the Plan or would change the definition of the corporations that may be designated by the Committee as Participating Companies. Notwithstanding the foregoing, in the event that the Committee determines that continuation of the Plan or an Offering would result in unfavorable financial accounting consequences to the Company, the Committee may, in its discretion and without the consent of any Participant, including with respect to an Offering Period then in progress: (i) terminate the Plan or any Offering Period, (ii) accelerate the Purchase Date of any Offering Period, (iii) reduce the discount or the method of determining the Purchase Price in any Offering Period (e.g., by determining the Purchase Price solely on the basis of the Fair Market Value on the Purchase Date), (iv) reduce the maximum number of shares of Stock that may be purchased in any Offering Period, or (v) take any combination of the foregoing actions.

23. **NO REPRESENTATIONS WITH RESPECT TO TAX QUALIFICATION.**

Although the Company may endeavor to (a) qualify Purchase Rights for favorable tax treatment under the laws of the United States or jurisdictions outside of the United States (e.g., options granted under Section 423 of the Code) or (b) avoid adverse tax treatment (e.g., under Section 409A of the Code), the Company makes no representation to that effect and expressly disavows any covenant to maintain favorable or avoid unfavorable tax treatment, anything to the contrary in this Plan. The Company shall be unconstrained in its corporate activities without regard to the potential negative tax impact on Participants under the Plan.

24. **CHOICE OF LAW.**

Except to the extent governed by applicable federal law, the validity, interpretation, construction and performance of the Plan and each Subscription 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 2019 Employee Stock Purchase Plan as duly adopted by the Board on June 10, 2019.

/s/ Stacy Taylor
Stacy Taylor, Secretary

APPENDIX A

Participating Companies in Section 423 Plan

Adaptive Biotechnologies Corporation

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 Amendment No. 1 to the Registration Statement (Form S-1 No. 333-231838) and related Prospectus of Adaptive Biotechnologies Corporation for the registration of 14,375,000 shares of its common stock.

/s/ Ernst & Young LLP

Seattle, Washington
June 14, 2019