As filed with the Securities and Exchange Commission on June 7, 2019.

Registration No. 333-231703

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

PERSONALIS, INC.

(Exact name of Registrant as specified in its charter)

Delaware	8071	27-5411038
(State or other jurisdiction of incorporation or organization)	(Primary Standard Industrial Classification Code Number)	(I.R.S. Employer Identification Number)

Personalis, Inc.
1330 O'Brien Drive
Menlo Park, CA 94025
(650) 752-1300
(Address, including zip code, and telephone number, including area code, of Registrant's principal executive offices)

John West
President and Chief Executive Officer
Personalis, Inc.
1330 O'Brien Drive
Menlo Park, CA 94025
(650) 752-1300
(Name, address, including zip code, and telephone number, including area code, of agent for service)

Copies to:

James C. Kitch **Michael Tenta** **Peter N. Mandel** **Cooley LLP** **3175 Hanover Street** **Palo Alto, CA 94304** **(650) 843-5000**	**Alan F. Denenberg** **Stephen Salmon** **Davis Polk & Wardwell LLP** **1600 El Camino Road** **Menlo Park, CA 94025** **(650) 752-2000**

Approximate date of commencement of proposed sale to the public: As soon as practicable after this Registration Statement is declared 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, 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, a smaller reporting company or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

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

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

CALCULATION OF REGISTRATION FEE

Title of Each Class of Securities To Be Registered	Amount to be Registered(1)	Proposed Maximum Aggregate Offering Price Per Share(2)	Proposed Maximum Aggregate Offering Price(2)	Amount of Registration Fee(3)
Common Stock, $0.0001 par value per share	7,666,667	$16.00	$122,666,672	$14,867.20

(1) Includes 1,000,000 shares of common stock that the underwriters have the option to purchase.
(2) Estimated solely for purposes of calculating the amount of the registration fee pursuant to Rule 457(a) under the Securities Act.
(3) The Registrant previously paid a registration fee of $13,938 in connection with the initial filing of this 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 or until the Registration Statement shall become effective on such date as the Commission, acting pursuant to said Section 8(a), may determine.

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The information in this preliminary prospectus is not complete and may be changed. We may not sell these securities until the registration statement filed with the Securities and Exchange Commission is effective. This prospectus is not an offer to sell these securities and we are not soliciting offers to buy these securities in any jurisdiction where the offer or sale is not permitted.

PRELIMINARY PROSPECTUS (Subject to Completion)
Issued June 7, 2019

6,666,667 Shares

Personalis®

COMMON STOCK

Personalis, Inc. is offering 6,666,667 shares of its common stock. This is our initial public offering and no public market currently exists for shares of our common stock. We anticipate that the initial public offering price will be between $14.00 and $16.00 per share.

We have applied to list our common stock on The Nasdaq Global Market under the symbol "PSNL."

We are an "emerging growth company" as defined under the U.S. federal securities laws and, as such, have elected to comply with certain reduced public company reporting requirements.

Investing in our common stock involves risks. See the section titled "Risk Factors" beginning on page 13 to read about factors you should consider before buying shares of our common stock.

PRICE $ A SHARE

	Price to Public	Underwriting Discounts and Commissions(1)	Proceeds to Personalis
Per Share	*$*	*$*	*$*
Total	*$*	*$*	*$*

(1) See the section titled "Underwriters" for a description of the compensation payable to the underwriters.

At our request, the underwriters have reserved up to 333,333 shares of common stock, or 5% of the shares offered by this prospectus, for sale at the initial public offering price in a directed share program, to our non-employee directors. See the section titled "Underwriters—Directed Share Program."

We have granted the underwriters the right to purchase up to 1,000,000 additional shares of common stock to cover over-allotments.

The Securities and Exchange Commission and state securities regulators have not approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

The underwriters expect to deliver the shares of common stock to purchasers on , 2019.

MORGAN STANLEY *BofA MERRILL LYNCH* *COWEN*

OPPENHEIMER & CO.

, 2019.

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Through and including , 2019 (the 25th day after the date of this prospectus), all dealers effecting transactions in these securities, whether or not participating in this offering, may be required to deliver a prospectus. This is in addition to a dealer's obligation to deliver a prospectus when acting as an underwriter and with respect to an unsold allotment or subscription.

We have not authorized anyone to provide you with any information or to make any representations other than those contained in this prospectus or in any free writing prospectuses we have prepared. We and the underwriters take no responsibility for, and can provide no assurance as to the reliability of, any other information that others may give you. We are offering to sell, and seeking offers to buy, shares of our common stock only in jurisdictions where offers and sales are permitted. 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 our common stock. Our business, financial condition, results of operations, and future growth prospects may have changed since that date.

For investors outside the United States: Neither we nor any of the underwriters have done anything 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 outside of the United States who come into possession of this prospectus must inform themselves about, and observe any restrictions relating to, the offering of the shares of our common stock and the distribution of this prospectus outside of the United States.

PROSPECTUS SUMMARY

This summary highlights selected information contained elsewhere in this prospectus. This summary does not contain all of the information you should consider before investing in our common stock. You should read this entire prospectus carefully, including the sections titled "Risk Factors," "Management's Discussion and Analysis of Financial Condition and Results of Operations," and our consolidated financial statements and the related notes included elsewhere in this prospectus, before making an investment decision. Our fiscal year ends on December 31. Unless the context otherwise requires, all references in this prospectus to "we," "us," "our," "our company," and "Personalis" refer to Personalis, Inc.

PERSONALIS, INC.

Overview

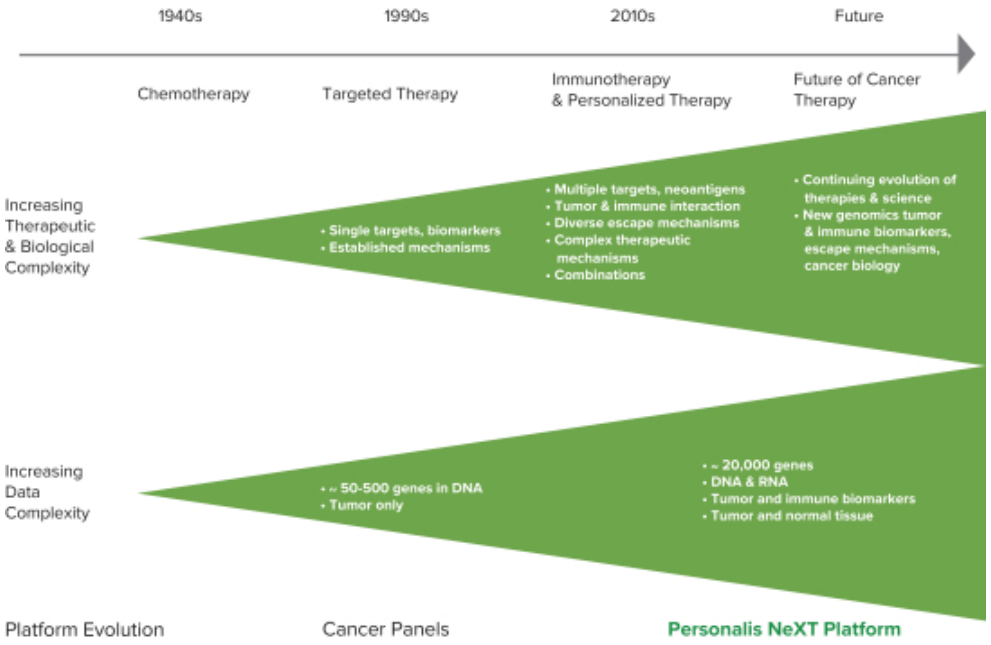
We are a growing cancer genomics company transforming the development of next-generation therapies by providing more comprehensive molecular data about each patient's cancer and immune response. We designed our NeXT Platform to adapt to the complex and evolving understanding of cancer, providing our biopharmaceutical customers with information on all of the approximately 20,000 human genes, together with the immune system, in contrast to many cancer panels that cover roughly 50 to 500 genes. We are also developing a complementary liquid biopsy assay that analyzes all human genes versus the more narrowly focused liquid biopsy assays that are currently available. By combining technological innovation, operational scale, and regulatory differentiation, our NeXT Platform is designed to help our customers obtain new insights into the mechanisms of response and resistance to therapy as well as new potential therapeutic targets. Our platform enhances the ability of biopharmaceutical companies to unlock the potential of conducting translational research in the clinic rather than with pre-clinical animal models or cancer cell lines. We are also planning to release a diagnostic based on our NeXT Platform that we envision being used initially by biopharmaceutical customers and clinical collaborators. Since inception, we have provided our services to more than 45 biopharmaceutical customers, including several of the largest pharmaceutical companies in the world.

In the past decade, the biopharmaceutical community has achieved major advances in the treatment of cancer, including approval of therapies capable of targeting specific genetic drivers of cancer and novel immunotherapies that empower the immune system to attack cancer cells. Despite these advances, the substantial majority of currently available cancer therapies have significant limitations, including efficacy only in certain subsets of patients, limited long-term survival rates, and significant toxicities. Moreover, the current research and development paradigm in oncology is beset by significant inefficiencies and substantial costs, with the average cost per patient in clinical trials reaching approximately $60,000. While tumor molecular profiling technologies have enhanced research and development efforts, most current tumor biopsy and liquid biopsy tests analyze a relatively narrow set of roughly 50 to 500 tumor genes, missing key genes and immune mechanisms underlying cancer therapy. With the lack of a comprehensive profiling solution, biopharmaceutical companies often attempt to use a disparate array of tests to compensate, resulting in a fragmented view of the tumor biology, insufficient tumor sample, logistical complexities, and increased costs. The resulting data heterogeneity makes it difficult to mine for new biological insights across cohorts of patients in clinical trials. These piecemeal approaches to tumor molecular profiling often result in solutions that are difficult to use at scale, especially in a clinical or therapeutic setting where simplicity, cost, turnaround time, and validation are important.

Our platform helps biopharmaceutical companies seeking to develop more efficacious therapies by comprehensively interrogating a patient's tumor and immune cells in detail, both to discover tumor vulnerabilities and elucidate potential therapeutic alternatives. To meet the demands of our customers, we built our NeXT Platform to be cost-effective and scalable with rapid turnaround times for tissue sample data and

analytics. NeXT represents the next step of our existing ACE platform, allowing customers to move up the value chain by gaining more information from a single sample. We believe that our platform has the potential to enable a research, development, and treatment paradigm that is dynamic and adaptive to the evolving genomic and immune system landscape of patients' tumors over time. We believe our technology will drive this evolving paradigm, which will enable our customers to develop safer and more efficacious therapeutics (see Figure 1). As the clinical utility of our platform increases, we expect to grow our diagnostic capabilities, including the ability to guide therapy based on a patient's changing tumor and immune system, supporting the commercialization of therapeutics developed by our biopharmaceutical customers.

Figure 1. Personalis NeXT Platform addresses the increasingly complex understanding of cancer.



Personalis: The Genomics Engine for Next-Generation Cancer Therapies

Biopharmaceutical customers use our comprehensive platform across a diverse set of therapeutic approaches to cancer. We generate and analyze data from patients who participated in clinical trials, which we believe will enable these customers to develop more effective therapies.

The information we generate is important to our customers developing three major classes of next-generation therapeutics: immunotherapies, targeted therapies, and personalized cancer therapies. Based on the approximately 195,000 patients who are currently expected to enroll in the over 1,600 immunotherapy, targeted therapy, and personalized therapy clinical trials that commenced in 2018, we estimate the total addressable market for multiple time point comprehensive tissue and liquid biopsy testing in clinical trials is over $5.0 billion annually. See the section titled "Market, Industry, and Other Data" for additional information regarding the data, sources, and assumptions we used for this estimate.

- **Immunotherapies:** Over the past decade, a number of drugs have emerged based on the discovery that the immune system plays a key role in addressing cancer. Checkpoint inhibitors, a specific type of immunotherapy, generated worldwide sales of over $16.6 billion in 2018, up from approximately

$1.4 billion in 2014. The commercial success of these drugs has shown the potential of immunotherapy; however, the development of new therapies in this category has been challenged by difficulties understanding the precise interaction between cancer and the immune system. The number of clinical trials in this space involving at least one cancer immunotherapy drug has grown from 123 that started in 2012 to 1,000 that started in 2018. Since our platform provides comprehensive insights on tumor and immune biology, including in both innate and adaptive immune cells, we believe it will enable biopharmaceutical companies to better understand how therapeutics are working in patients.

- **Targeted Therapies:** A growing category of successful cancer treatments consists of therapies that target specific genes or molecular mechanisms of cancer. These drugs are not designed to influence the immune system directly, but the success of immunotherapies has brought acknowledgment that the immune system has a significant effect on their efficacy. Many of these targeted therapies are proposed to be tested in combination with immunotherapies. These therapies have grown to represent a considerable share of the overall oncology therapeutics market today. Comprehensively understanding each patient's genomic and immune profile is critical to understanding which of these therapies a patient may respond to. We believe that more comprehensive coverage of all of the approximately 20,000 genes positions us competitively against existing cancer panels that cover roughly 50 to 500 genes. We are positioning our company to be a leading provider of the complex information that we believe will continue to inform the development of targeted cancer therapies.
- **Personalized Cancer Therapies:** Many biopharmaceutical companies are pursuing personalized cancer therapies, which are designed and manufactured, individually, for each patient based on genomic alterations in a given patient's tumor. While there are many potential approaches to developing these therapies including neoantigen-based vaccines and T-cell therapies, all of them can potentially benefit from the data and analytics that our platform can generate about a patient's tumor. Given the more than 700,000 cancer patients projected to be diagnosed with late-stage disease in the United States in 2019, we estimate that the total addressable market for our data and analytics for personalized cancer therapy could reach as much as $20 billion in the United States and as much as $40 billion worldwide. See the section titled "Market, Industry, and Other Data" for additional information regarding the data, sources, and assumptions we used for this estimate. Many of our customers have leveraged our U.S. Food and Drug Administration (the "FDA") Device Master File as a component of their investigational new drug ("IND") filings with the FDA. We anticipate that if drugs are approved that used our platform in the clinical trials forming the basis for approval, we may be able to derive revenue in connection with the sale of these drugs. We believe we are working with the majority of companies developing neoantigen-targeted personalized cancer therapies.

We anticipate that as the clinical utility of our platform is validated, we will have opportunities in connection with diagnostics and the commercialization of cancer therapeutics, which are significantly larger than our initial clinical-trial focused markets. Over time, we expect our biopharmaceutical customers and research collaborators to build evidence of clinical utility for our platform as a diagnostic for advanced cancer therapies. Separately, we are also acquiring samples and are building a database which will hold value for our biopharmaceutical customers and may ultimately allow us to discover new mechanisms of cancer treatment.

The NeXT Platform

Our NeXT Platform is designed to provide comprehensive analysis of both a tumor and its immune microenvironment from a single limited tissue sample. Our platform covers the deoxyribonucleic acid ("DNA") sequence of all of the approximately 20,000 human genes. We also report on the entire transcriptome of a tumor, which encompasses ribonucleic acid ("RNA") expression across the approximately 20,000 human genes, allowing us to more accurately determine which of the many genomic mutations might actually be driving tumor progression. Furthermore, our platform analyzes elements of the immune cells that have infiltrated a tumor both from the adaptive immune system and the innate immune system.

Given the practical challenges in obtaining high-quality tumor samples via biopsy, we have developed our platform to work with a limited tumor tissue sample. Biopharmaceutical companies face significant challenges in attempting to divide samples to ship to multiple service providers to perform different tests. If a biopharmaceutical company is successful in acquiring results from multiple service providers, it is challenging to compare the results across multiple data platforms from multiple service providers. Our platform is composed of multiple proprietary technologies, many of which we have developed from the ground up. The breadth of the assays that we have integrated into our platform, our proprietary sample preparation process, and the comprehensiveness of our platform allow us to maximize the utility of often limited tumor tissue samples that our customers have from their clinical trials.

We have also shown that our technology can analyze cell-free DNA ("cfDNA") obtained from blood plasma, also known as a liquid biopsy. As with a tissue biopsy, we plan to analyze all of the approximately 20,000 human genes in each plasma sample, in contrast to currently marketed liquid biopsy panels. We expect this cfDNA to be obtained by a blood draw concurrently with a tissue sample. Together, the two samples can be used to provide a more comprehensive initial characterization of the tumor. Additionally, we expect to monitor changes in tumor genetics that arise in response to therapy through serial measurements using cfDNA samples collected across multiple time points. In 2020, we plan to launch our first liquid biopsy assay designed to analyze all human genes so as to detect potential neoantigens and tumor escape mechanisms that arise under therapeutic pressure. Although we believe our cfDNA test will offer new insights, we believe it will be most useful for our biopharmaceutical customers alongside our primary tumor biopsy product, given that a tumor biopsy is required to analyze gene expression and elucidate tumor-infiltrating lymphocytes, which are critical to understanding cancer's interaction with the immune system.

Robust Operational Infrastructure to Scale with Our Customers

We have invested significant resources to develop an operational infrastructure that allows us to easily customize our services for each of our customers and scale rapidly to meet their potential research and commercial demands. Our NeXT Platform is complemented by our enterprise-grade software and bespoke information management systems that we tailor to meet our customers' unique needs and integrate with their workflows. Moreover, our infrastructure provides customers with visibility and control over processes, ensures consistency across all components used for the duration of each clinical trial, is traceable for compliance purposes, and allows us to scale while maintaining rapid turnaround times.

We designed our proprietary informatics system, the Symphony Enterprise Informatics System ("Symphony"), as a flexible and scalable enterprise-grade system used to manage the unique complexities and challenges of our genomics laboratory. Symphony integrates laboratory information management systems and bioinformatics systems to connect laboratory operations with downstream data analysis. Symphony orchestrates all operational activities from our laboratory starting with sample receipt to the reporting of results of the genomic profiling and data delivery. We also use machine learning and artificial intelligence approaches to generate substantial performance advantages for our algorithms, such as neoantigen binding prediction.

We are sequencing and analyzing up to 100 trillion bases of DNA per week in our facility. We believe this capacity is already larger than most cancer genomics companies and we are building the automation and other infrastructure to scale further as demand increases and in support of the planned 2020 launch of our NeXT liquid biopsy assay.

Since 2012, we have been contracted to provide DNA sequencing and data analysis services to the U.S. Department of Veterans Affairs' (the "VA") Million Veteran Program (the "VA MVP"). The VA MVP began collecting samples in 2011 and is a landmark research effort aimed at better understanding how genetic variations affect health. Up to a million veterans are expected to enroll in the VA MVP study by 2021. With approximately

750,000 enrollees to date, the VA MVP exceeds the enrollment numbers of any single VA study or research program in the past, and is in fact one of the largest research cohorts of its kind. In September 2017, we entered into a one-year contract with three one-year renewal option periods with the VA for the VA MVP, and received orders under this contract in September 2017 and 2018. This relationship with the VA MVP has enabled us to innovate, scale our operational infrastructure, and achieve greater efficiencies in our lab. It has also supported our development of industry-leading, large-scale cancer genomic testing. The substantial experience that we have and expect to continue to develop in whole genome sequencing also optimally positions us for what we anticipate to be the longer-term strategic direction of the cancer genomics industry, which may include whole genome sequencing of tumors.

We believe our platform is well positioned to scale rapidly and substantially as the field of personalized cancer therapies matures. We believe that our platform could be essential to the composition and manufacture of any personalized cancer therapy developed using our platform. Furthermore, we expect that patients would be tested at multiple time points during the course of treatment: first to design a therapy according to an initial genomic profile generated from a tissue and/or liquid biopsy, and then as follow-up testing via liquid biopsy to detect any changes that would require therapy modifications after initial therapeutic interventions. If a therapy that uses our NeXT Platform achieves regulatory approval, we believe that our commercial opportunity may increase substantially.

Personalis is Valuable to Biopharmaceutical Companies

We believe that our platform is valuable to our customers because:

- **Our tumor and immune molecular profiling capabilities provide an unprecedented breadth of data from a single limited tumor sample.** We provide information on all of the approximately 20,000 human genes, as well as gene expression, the immune system, and other elements of cancer biology, in contrast to other currently marketed panels that cover a limited range of roughly 50 to 500 genes and do not focus on immune cells.
- **Our platform enhances the opportunity to conduct translational research by analyzing tumor tissues from patients in clinical trials, rather than animal models or in vitro cancer cell lines, which have historically limited cancer research.** While conventional pre-clinical model systems, such as animal models and cancer cell lines, have been instrumental in early-stage cancer research and drug development, translation of results to the clinic has been limited and remains a significant barrier to progress, in part because these models do not sufficiently reflect the complexity of human cancer and the human immune system. Over recent years, tools used to study tissue from patients have improved and the utilization of tissue from trials has increased. We believe our platform represents the next step in this transition by further enabling biopharmaceutical companies to address the historical limitations of analyzing patient tissue comprehensively.
- **The information we provide to personalized cancer therapy companies can be used to design therapeutics.** Many biopharmaceutical companies are pursuing personalized cancer therapies, which are designed and manufactured, individually, for each patient based on genomic alterations in a given patient's tumor. While there are many potential approaches to developing these therapies including neoantigen-based vaccines and T-cells therapies, all of them can potentially benefit from the data and analytics that our platform can generate about a patient's tumor.
- **Our enterprise-grade operational infrastructure is scalable, enables rapid turnaround times, and is tailored to meet the unique workflow needs of our customers.** We have invested significant resources to develop an operational infrastructure that allows us to easily customize our services for each of our customers and scale rapidly to meet their potential research and commercial demands.

- **We are developing a complementary liquid biopsy test, which also offers broad 20,000-gene coverage versus more narrowly focused liquid biopsy tests that are currently available.** While tumor biopsies are necessary to provide tumor immune microenvironment and gene expression information that current liquid biopsy panels do not provide, we believe a comprehensive liquid biopsy test used in concert with our tissue test can provide complementary information across multiple time points.

Our Strategy

Our mission is to transform the development of next generation cancer therapies by providing more comprehensive molecular data about each patient's tumor. To achieve this mission, our strategy is to:

- **Drive adoption of our platform by establishing and expanding relationships with leading developers of oncology therapeutics;**
- **Invest in new product innovations and enhancements to maintain our leading position;**
- **Continue to build a body of evidence demonstrating the utility of comprehensive genomic data;**
- **Continue to grow our relationship with the VA MVP to innovate and scale our operational infrastructure;**
- **Leverage a growing body of evidence from our platform to develop a diagnostic; and**
- **Build out a comprehensive tumor-genomics database.**

Our Team

We have assembled a multidisciplinary team of experienced industry leaders to drive continuous innovation. Scientific and operational excellence is a guiding principle for our employees. We have invested not only in the technology to provide information of sufficient quality for clinical use, but also in the people to continuously innovate for the industry's growing and changing demands.

Our President and Chief Executive Officer, John West, co-founded our company in 2011 in conjunction with four Stanford professors, Euan Ashley, M.D., Ph.D., Atul Butte, M.D., Ph.D., Russ Altman, M.D., Ph.D., and Michael Snyder, Ph.D. More broadly, our executive officers and management team members have had previous experience at a variety of genomics, pharmaceuticals, biotechnology, diagnostics, data analytics, service, enterprise software, and technology companies including Agilent Technologies, Inc., Applied Biosystems Inc., ARMO Biosciences, Inc., Illumina, Inc., Informatica LLC, Ingenuity Systems, Inc., Lumentum Holdings Inc., Merck & Co., Inc., Molecular Dynamics, Inc., Natera, Inc., Novartis Pharmaceuticals Corp., Pacific Biosciences of California, Inc., RainDance Technologies, Inc., and Solexa, Ltd.

Financial Highlights

Our revenues have grown rapidly as our penetration of clinical trials in advanced oncology therapeutics has expanded, consistent with our reputation as a leader in the field. We generated revenues of $9.4 million, $37.8 million, and $14.1 million for the years ended December 31, 2017 and 2018 and the three months ended March 31, 2019, respectively. We also incurred net losses of $23.6 million, $19.9 million, and $5.7 million for the years ended December 31, 2017 and 2018 and the three months ended March 31, 2019, respectively.

As of March 31, 2019, we had $33.2 million of cash and cash equivalents, an increase of $11.4 million from March 31, 2018. Our revenues are primarily generated through sales of our services to biopharmaceutical companies and the VA MVP. Unlike diagnostic or therapeutic companies, we have not sought reimbursement through traditional healthcare payors. We have raised $89.6 million in preferred stock equity financing to date.

Risk Factors Summary

Investing in our common stock involves numerous risks, including the risks described in the section titled "Risk Factors" and elsewhere in this prospectus. You should carefully consider these risks before making an investment. The following are some of these risks, any of which could have an adverse effect on our business financial condition, operating results, or prospects.

- We have a history of losses, and as our costs increase, we expect to incur significant losses for the foreseeable future and may not be able to generate sufficient revenue to achieve or sustain profitability.
- If we are unable to increase sales of our current services or successfully develop and commercialize other services, our revenues will be insufficient for us to achieve profitability.
- Certain of our customers prepay us for a portion of the services that they expect to order from us in the future, and we may be required to refund some or all of those prepayments if a customer cancels its contract with us or reduces the level of services that it expects to receive.
- If we are unable to execute our sales and marketing strategy for our services and are unable to gain sufficient acceptance in the market, we may be unable to generate sufficient revenue to sustain our business.
- If we cannot compete successfully with our competitors, we may be unable to increase or sustain our revenues or achieve and sustain profitability.
- Our inability to raise additional capital on acceptable terms in the future may limit our ability to continue to operate our business and further expand our operations.
- We will need to invest in our infrastructure in advance of increased demand for our services, and our failure to accurately forecast demand would have a negative impact on our business and our ability to achieve and sustain profitability.
- We have substantial customer concentration, with a limited number of customers accounting for a substantial portion of our 2018 revenues and accounts receivable.
- Our tests may be subject to regulatory action if regulatory agencies determine that our tests do not appropriately comply with statutory and regulatory requirements enforced by the FDA and/or CLIA requirements for quality laboratory testing.
- Litigation or other proceedings or third-party claims of intellectual property infringement, misappropriation or other violations may require us to spend significant time and money, and could in the future prevent us from selling our tests or impact our stock price, any of which could have a material adverse effect.
- We have identified a material weakness in our internal control over financial reporting and may identify additional material weaknesses in the future or otherwise fail to maintain an effective system of internal controls, which may result in material misstatements of our financial statements or cause us to fail to meet our periodic reporting obligations.
- Insiders will exercise significant control over our company and will be able to influence corporate matters.

Corporate Information

We were incorporated under the laws of the state of Delaware in February 2011 under the name Personalis, Inc. Our principal executive offices are located at 1330 O'Brien Drive, Menlo Park, California 94025. Our telephone number is (650) 752-1300. Our website address is https://www.personalis.com. Information contained on, or that can be accessed through, our website is not incorporated by reference into this prospectus, and you should not consider information on our website to be part of this prospectus.

Personalis, the Personalis logo, and our other registered or common law trade names, trademarks, or service marks appearing in this prospectus are the property of Personalis, Inc. Trade names, trademarks, and service marks of other companies appearing in this prospectus are the property of their respective owners.

Implications of Being an Emerging Growth Company

As a company with less than $1.07 billion in revenues during our last fiscal year, we qualify as an "emerging growth company" as defined in the Jumpstart Our Business Startups Act (the "JOBS Act"), enacted in April 2012. An emerging growth company may take advantage of reduced reporting requirements that are otherwise applicable to public companies. These provisions include, but are not limited to:

- not being required to comply for a certain period of time with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, as amended;
- reduced disclosure obligations regarding executive compensation in our periodic reports, proxy statements, and registration statements; and
- exemptions from the requirements of holding a stockholder advisory vote on executive compensation and any golden parachute payments not previously approved.

We may take advantage of these provisions until the last day of our fiscal year following the fifth anniversary of the date of the first sale of our common stock in this offering. However, if certain events occur prior to the end of such five-year period, including if (i) we become a "large accelerated filer," with at least $700 million of equity securities held by non-affiliates; (ii) our annual gross revenues exceed $1.07 billion; or (iii) we issue more than $1.0 billion of non-convertible debt in any three-year period, we will cease to be an emerging growth company prior to the end of such five-year period.

We have elected to take advantage of certain of the reduced disclosure obligations in the registration statement of which this prospectus is a part and may elect to take advantage of other reduced reporting requirements in future filings. As a result, the information that we provide to our stockholders may be different than you might receive from other public reporting companies in which you hold equity interests.

In addition, the JOBS Act provides that an emerging growth company can take advantage of an extended transition period for complying with new or revised accounting standards. This provision allows an emerging growth company to delay the adoption of some accounting standards until those standards would otherwise apply to private companies. We have irrevocably elected not to avail ourselves of this exemption and, therefore, we will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

THE OFFERING

Common stock offered by us	6,666,667 shares
Common stock to be outstanding after this offering	28,496,368 shares
Over-allotment option to purchase additional shares	1,000,000 shares
Use of proceeds	We estimate that the net proceeds from the sale of our common stock in this offering will be approximately $89.8 million (or approximately $103.8 million if the underwriters exercise their over-allotment option in full), based on the assumed initial public offering price of $15.00 per share and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. The principal purposes of this offering are to increase our capitalization and financial flexibility and create a public market for our common stock. We currently intend to use the net proceeds we receive from this offering for expanded research and development, infrastructure expansion, facilities expansion, headcount growth, sales and marketing expenditures, public company costs, other capital expenditures, and working capital. See the section titled “Use of Proceeds” for additional information.
Risk factors	See the section titled “Risk Factors” for additional information.
Directed share program	At our request, the underwriters have reserved up to 333,333 shares of common stock, or up to 5% of the shares offered by this prospectus, for sale at the initial public offering price through a directed share program to our non-employee directors. The sales will be made at our direction by Morgan Stanley & Co. LLC and its affiliates through a directed share program. The number of shares of our common stock available for sale to the general public in this offering will be reduced to the extent that such persons purchase such reserved shares. Any reserved shares not so purchased will be offered by the underwriters to the general public on the same terms as the other shares of common stock offered by this prospectus. Any of our non-employee directors that participate in this directed share program will be subject to lockup and market standoff restrictions with the underwriters and with us with respect to any shares purchased through the directed share program. For additional information, see the section titled “Underwriters—Directed Share Program.”
Proposed trading symbol on The Nasdaq Global Market	“PSNL”

The number of shares of our common stock that will be outstanding after this offering is based on 21,829,701 shares of our common stock (including shares of our redeemable convertible preferred stock on an as-converted basis, and assuming the exercise of a warrant to purchase 188,643 shares of our common stock) outstanding as of March 31, 2019, and excludes:

- 4,381,884 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Equity Incentive Plan (the "2011 Plan"), and outstanding as of March 31, 2019, with a weighted-average exercise price of $3.62 per share;
- 363,440 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Plan after March 31, 2019, with an exercise price of $13.20 per share;
- 84,585 shares of our redeemable convertible preferred stock issuable upon the exercise of warrants to purchase shares of our redeemable convertible preferred stock outstanding as of March 31, 2019, with a weighted-average exercise price of $7.13 per share;
- 65,502 shares of our common stock issuable upon the exercise of a warrant to purchase shares of our common stock outstanding as of March 31, 2019, with an exercise price of $9.16 per share;
- 7,440,524 shares of our common stock reserved for future issuance under our 2019 Equity Incentive Plan (the "2019 Plan"), (including up to 5,440,524 shares of our common stock comprised of (i) the shares reserved and remaining available for issuance under our 2011 Plan that will be added to our 2019 Plan reserve upon its effectiveness plus (ii) the number of shares subject to stock options or other stock awards granted under our 2011 Plan that would have otherwise returned to our 2011 Plan, which will be added as they become available (e.g., due to forfeiture of the underlying 2011 Plan award)) which includes an annual evergreen increase and will become effective in connection with this offering; and
- 250,000 shares of our common stock reserved for future issuance under our 2019 Employee Stock Purchase Plan (the "ESPP"), which includes an annual evergreen increase and will become effective in connection with this offering.

Unless otherwise indicated, the information in this prospectus assumes:

- an initial public offering price of $15.00 per share, which is the midpoint of the estimated offering price range set forth on the cover page of this prospectus;
- the automatic conversion of all outstanding shares of our redeemable convertible preferred stock into 18,474,742 shares of our common stock immediately prior to the closing of this offering;
- a four-for-one reverse stock split of our common stock and redeemable convertible preferred stock, which was effected on June 4, 2019 (all share and per share amounts in this prospectus have been presented in a retrospective basis to reflect the reverse stock split);
- no exercise of the outstanding options described above;
- the cash exercise of an outstanding warrant to purchase 188,643 shares of our common stock;
- no exercise of the outstanding warrants to purchase shares of our redeemable convertible preferred stock described above and the automatic conversion of such warrants into warrants exercisable for 84,585 shares of our common stock;
- no exercise of an outstanding warrant to purchase 65,502 shares of our common stock described above;
- no exercise of the underwriters' option to purchase up to an additional 1,000,000 shares of common stock to cover over-allotments; and
- the filing and effectiveness of our amended and restated certificate of incorporation and the adoption of our amended and restated bylaws, each of which will occur prior to the closing of this offering.

SUMMARY CONSOLIDATED FINANCIAL DATA

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

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
	(in thousands, except share and per share data)			
Consolidated Statements of Operations Data:				
Revenues	$ 9,393	$ 37,774	$ 4,164	$ 14,075
Costs and expenses				
Costs of revenues(1)	11,736	25,969	4,065	10,091
Research and development(1)	9,919	14,304	2,949	5,245
Selling, general, and administrative(1)	9,901	11,271	2,313	4,170
Total costs and expenses	31,556	51,544	9,327	19,506
Loss from operations	(22,163)	(13,770)	(5,163)	(5,431)
Interest income	100	293	61	84
Interest expense	(1,303)	(1,894)	(622)	(184)
Loss on debt extinguishment	—	(4,658)	—	—
Other (expense) income, net	(227)	150	351	(152)
Loss before income taxes	(23,593)	(19,879)	(5,373)	(5,683)
Provision for income taxes	(5)	(7)	(2)	(2)
Net loss	$ (23,598)	$ (19,886)	$ (5,375)	$ (5,685)
Net loss per share, basic and diluted(2)	$ (7.78)	$ (6.49)	$ (1.76)	$ (1.84)
Weighted-average shares outstanding, basic and diluted(2)	3,031,636	3,063,157	3,051,581	3,091,342
Pro forma net loss per share, basic and diluted (unaudited)(2)		$ (0.95)		$ (0.26)
Pro forma weighted-average shares outstanding, basic and diluted (unaudited)(2)		20,483,543		21,754,727

(1) Includes stock-based compensation as follows:

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
	(in thousands)			
Costs of revenues	$ 74	$ 177	$ 24	$ 85
Research and development	225	429	64	164
Selling, general, and administrative	454	711	81	360
Total stock-based compensation expense	$ 753	$ 1,317	$ 169	$ 609

(2) See the consolidated statements of operations and Note 15 to our consolidated financial statements included elsewhere in this prospectus for an explanation of the method used to compute the historical and pro forma net loss per share and the number of shares used in the computation of the per share amounts.

	As of March 31, 2019		
	Actual	Pro Forma(1)	Pro Forma as Adjusted(2)(3)
		(unaudited) (in thousands)	
Consolidated Balance Sheet Data:			
Cash and cash equivalents	$ 33,237	$ 33,245	$ 123,045
Working capital(4)	(15,348)	(15,340)	74,460
Total assets	57,647	57,655	147,455
Redeemable convertible preferred stock warrant liability	817	—	—
Additional paid-in capital	10,666	101,784	191,583
Accumulated deficit	(121,190)	(122,080)	(122,080)
Total stockholders' equity (deficit)	(110,523)	(20,294)	69,506

(1) The pro forma consolidated balance sheet data gives effect to (i) the automatic conversion of all of our outstanding shares of redeemable convertible preferred stock as of March 31, 2019 into 18,474,742 shares of our common stock immediately prior to the closing of this offering, (ii) the assumed cash exercise of a warrant to purchase 188,643 shares of our common stock, (iii) the automatic conversion of two warrants to purchase an aggregate of 84,585 shares of our redeemable convertible preferred stock, outstanding as of March 31, 2019, into warrants to purchase an equivalent number of shares of our common stock, and the related reclassification of redeemable convertible preferred stock warrant liability to stockholders' equity, (iv) stock-based compensation expense of $0.9 million associated with outstanding stock options subject to a performance condition for which the service-based vesting condition was satisfied as of March 31, 2019 and which we will recognize in connection with this offering, and (v) the filing and effectiveness of our amended and restated certificate of incorporation that will be in effect immediately prior to the closing of this offering. For additional information, see Note 1 to our consolidated financial statements included elsewhere in this prospectus.

(2) The pro forma as adjusted consolidated balance sheet data gives effect to (i) the pro forma items described in footnote (1) above and (ii) the issuance and sale by us of 6,666,667 shares of our common stock in this offering at the assumed initial public offering price of $15.00 per share, after deducting the underwriting discounts and commissions and estimated offering expenses payable by us and the use of proceeds to satisfy the withholding tax obligations described in the footnote above.

(3) The pro forma as adjusted consolidated balance sheet data is illustrative only and will change based on the actual initial public offering price and other terms of this offering determined at pricing. Each $1.00 increase (decrease) in the assumed initial public offering price of $15.00 per share would increase (decrease) each of our pro forma as adjusted cash and cash equivalents, working capital, total assets, additional paid-in capital and total stockholders' deficit by $6.2 million, 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 underwriting discounts and commissions and estimated offering expenses payable by us. Similarly, each increase (decrease) of 1.0 million shares in the number of shares of common stock offered by us would increase (decrease) each of our pro forma as adjusted cash and cash equivalents, working capital, total assets, additional paid-in capital, and total stockholders' deficit by approximately $14.0 million, assuming the assumed initial public offering price of $15.00 per share remains the same, and after deducting the underwriting discounts and commissions and estimated offering expenses payable by us.

(4) Working capital is defined as total current assets less total current liabilities. See our consolidated financial statements and the related notes included elsewhere in this prospectus for further details regarding our current assets and current liabilities.

RISK FACTORS

Investing in our common stock involves a high degree of risk. You should consider and read carefully all of the risks and uncertainties described below, as well as other information included in this prospectus, including our consolidated financial statements and related notes appearing at the end of this prospectus, before making an investment decision. The occurrence of any of the following risks or additional risks and uncertainties not presently known to us or that we currently believe to be immaterial could materially and adversely affect our business, financial condition, or results of operations. In such case, the trading price of our common stock could decline, and you may lose all or part of your original investment. This prospectus also contains forward-looking statements and estimates that involve risks and uncertainties. Our actual results could differ materially from those anticipated in the forward-looking statements as a result of specific factors, including the risks and uncertainties described below.

Risks Related to Our Business and Strategy

We have a history of losses, and as our costs increase, we expect to incur significant losses for the foreseeable future and may not be able to generate sufficient revenue to achieve or sustain profitability.

We have incurred net losses since our inception. For the years ended December 31, 2017 and 2018 and the three months ended March 31, 2019, we had net losses of $23.6 million, $19.9 million, and $5.7 million, respectively. As of March 31, 2019, we had an accumulated deficit of $121.2 million. To date, we have not generated sufficient revenue to achieve profitability, and we may never achieve or sustain profitability. In addition, we expect to continue to incur net losses for the foreseeable future, and we expect our accumulated deficit to continue to increase as we focus on scaling our business and operations. Our efforts to sustain and grow our business may be more costly than we expect, and we may not be able to increase our revenue sufficiently to offset our higher operating expenses. Our prior losses and expected future losses have had and will continue to have an adverse effect on our stockholders' equity and working capital. Our failure to achieve and sustain profitability in the future would negatively affect our business, financial condition, results of operations, and cash flows, and could cause the market price of our common stock to decline.

If we are unable to increase sales of our current services or successfully develop and commercialize other services or products, our revenues will be insufficient for us to achieve profitability.

We currently derive substantially all of our revenues from sales of our services. We began offering our services through our Clinical Laboratory Improvement Amendments of 1988 ("CLIA")-certified, College of American Pathologists ("CAP")-accredited, and state-licensed laboratory in 2013. We are in varying stages of research and development for other services and products that we may offer. If we are unable to increase sales of our existing services or successfully develop and commercialize other services and products, we will not generate sufficient revenues to become profitable.

Certain of our customers prepay us for a portion of the services that they expect to order from us in the future and we may be required to refund some or all of those prepayments if a customer cancels its contract with us or reduces the level of services that it expects to receive.

Certain of our customers prepay us for a portion of the services that they expect to order from us before they place purchase orders and we deliver those services. In some cases, this prepayment can be substantial and may be paid months or a year or more in advance of these customers providing samples to us and before our delivery of the services to which some or all of the deposit relates. As of March 31, 2019, we had approximately $44.3 million in customer deposits, including $39.6 million from one customer. However, as of that date, we had only $33.2 million of cash and cash equivalents. We are generally not required by our contracts to retain these

deposits in cash or otherwise and we have generally used these deposits to make capital expenditures and fund our operations. If a customer that has prepaid us for future services cancels its contract with us or reduces the level of services that it expects to receive, we would generally be required to repay that customer's deposit with little or no notice. We may not have the cash or other available resources to satisfy that repayment obligation. Even if we are able to satisfy the repayment obligation from available resources (including potentially a portion of the net proceeds of this offering), we may need to seek additional sources of capital to fund our operations, which funding may not be available when needed or on acceptable terms. In either of those circumstances, our business, financial condition, results of operations, and reputation would be materially and adversely affected. Furthermore, in the future customers may elect not to prepay us for our services in which case we would have to find other sources of funding for our capital expenditures and operations, which would be costly relative to the aforementioned cost-free customer deposit funding and which may not be available when needed or on acceptable terms.

If we are unable to execute our sales and marketing strategy for our services and are unable to gain sufficient acceptance in the market, we may be unable to generate sufficient revenues to sustain our business.

We are a growing genomics company and have engaged in targeted sales and marketing activities for our services. Although we have had revenues from sales of our services since 2013, our services may never gain significant acceptance in the marketplace and therefore may never generate substantial revenues or permit us to become profitable. We will need to further establish and grow the market for our services through the expansion of our current relationships and development of new relationships with biopharmaceutical customers. Gaining acceptance in medical communities can be supported by, among other things, publications in leading peer-reviewed journals of results from studies using our services. The process of publication in leading medical journals is subject to a peer review process and peer reviewers may not consider the results of our studies sufficiently novel or worthy of publication. Failure to have our studies published in peer-reviewed journals would limit the adoption of our services.

Our ability to successfully market our services that we have developed, and may develop in the future, will depend on numerous factors, including:

- our ability to demonstrate the utility and value of our services to our customers;
- the success of our sales force;
- whether biopharmaceutical companies accept that our services are sufficiently sensitive and specific;
- our ability to convince biopharmaceutical companies of the utility of the comprehensiveness of our services and of testing patients at multiple time points;
- our ability to continue to fund sales and marketing activities;
- whether our services are considered superior to those of our competitors;
- any negative publicity regarding our or our competitors' services resulting from defects or errors;
- our success obtaining and maintaining patent and trade secret protection for our services and technologies; and
- our success enforcing and defending intellectual property rights and claims.

Failure to achieve broad market acceptance of our services would materially harm our business, financial condition, and results of operations.

If we cannot compete successfully with our competitors, we may be unable to increase or sustain our revenues or achieve and sustain profitability.

Our principal competition comes from commercial and academic organizations using established and new laboratory tests to produce information that is similar to the information that we generate for our customers.

These commercial and academic organizations may not utilize our services or may not believe them to be superior to those tests that they currently use or others that are developed. Further, it may be difficult to convince our customers to use our comprehensive test rather than simpler panels provided by our competitors. For example, the information that we provide may be more challenging or require additional resources for our customers to interpret than the information provided by our competitors' less comprehensive assays.

Some of our present and potential competitors, including Guardant Health, Inc., Foundation Medicine, Inc., which was acquired by Roche Holdings, Inc. in July 2018, Roche Molecular Systems, Inc., NanoString Technologies, Inc., Personal Genome Diagnostics, Inc., and Adaptive Biotechnologies Corporation, may have widespread brand recognition and substantially greater financial and technical resources and development, production capacities, and marketing capabilities than we do. They may be able to devote greater resources to the development, promotion, and sale of their products and services than we do or sell their products and services at prices designed to win significant levels of market share. In addition, competitors may be acquired by, receive investments from, or enter into other commercial relationships with larger, well-established, and well-financed companies. Others may develop lower-priced, less complex products and services that pharmaceutical companies could view as functionally equivalent to our current or planned future services, which could force us to lower the price of our services and impact our operating margins and our ability to achieve and maintain profitability. In addition, companies or governments that control access to genetic testing and related services through umbrella contracts or regional preferences could promote our competitors or prevent us from performing certain services. In addition, technological innovations that result in the creation of enhanced products or diagnostic tools that are more sensitive or specific than ours may enable other clinical laboratories, hospitals, physicians, or medical providers to provide specialized products or services similar to ours in a more patient-friendly, efficient, or cost-effective manner than is currently possible. If we cannot compete successfully against current or future competitors, we may be unable to ensure or increase market acceptance and sales of our current or planned future services, which could prevent us from increasing or sustaining our revenues or achieving or sustaining profitability.

We expect that biopharmaceutical companies will increasingly focus attention and resources on the targeted and personalized cancer diagnostic sector as the potential and prevalence of molecularly targeted oncology therapies approved by the U.S. Food and Drug Administration (the "FDA") along with companion diagnostics increases. For example, the FDA has approved several such targeted oncology therapies that use companion diagnostics, including the anaplastic lymphoma kinase FISH test from Abbott Laboratories, Inc. for use with Xalkori® from Pfizer Inc., the BRAF kinase V600 mutation test from Roche Molecular Systems, Inc. for use with Zelboraf® from Daiichi-Sankyo/Genentech/Roche, and the BRAF kinase V600 mutation test from bioMerieux for use with Tafinlar® from GlaxoSmithKline. Since companion diagnostic tests are part of FDA labeling, non-FDA cleared tests, such as the ones we currently offer as part of our services, would be considered an off-label use and this may limit our access to this market segment.

Additionally, projects related to cancer diagnostics and particularly genomics have received increased government funding, both in the United States and internationally. As more information regarding cancer genomics becomes available to the public, we anticipate that more products aimed at identifying targeted treatment options will be developed and that these products may compete with our services. In addition, competitors may develop their own versions of our current or planned future services in countries where we did not apply for or receive patents and compete with us in those countries, including encouraging the use of their products or services by biopharmaceutical companies in other countries.

Our inability to raise additional capital on acceptable terms in the future may limit our ability to continue to operate our business and further expand our operations.

We expect capital expenditures and operating expenses to increase over the next several years as we continue to operate our business and expand our infrastructure, commercial operations, and research and development activities. Additionally, if we decide to grow our business by developing in vitro diagnostic tests,

our capital expenditures and operating expenses would significantly increase. We may seek to raise additional capital through equity offerings, debt financings, collaborations, or licensing arrangements. Additional funding may not be available to us on acceptable terms, or at all.

The various ways we could raise additional capital carry potential risks. If we raise funds by issuing equity securities, dilution to our stockholders would result. Any equity securities issued may also provide for rights, preferences, or privileges senior to those of holders of our common stock. In addition, the issuance of additional equity securities by us, or the possibility of such issuance, may cause the market price of our common stock to decline. 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, if available, could impose significant restrictions on our operations. The incurrence of additional indebtedness or the issuance of certain equity securities could result in increased fixed payment obligations and could also result in restrictive covenants, such as limitations on our ability to incur additional debt or issue additional equity, limitations on our ability to acquire or license intellectual property rights, and other operating restrictions that could adversely affect our ability to conduct our business. In the event that we enter into collaborations or licensing arrangements to raise capital, we may be required to accept unfavorable terms. These agreements may require that we relinquish or license to a third party on unfavorable terms our rights to tests we otherwise would seek to develop or commercialize ourselves, or reserve certain opportunities for future potential arrangements when we might be able to achieve more favorable terms.

If we are not able to secure additional funding when needed, we may have to delay, reduce the scope of or eliminate one or more research and development programs or sales and marketing initiatives. In addition, we may have to work with a partner on one or more aspects of our tests or market development programs, which could lower the economic value of those tests or programs to us. While we believe our existing cash and cash equivalents, and the anticipated proceeds from this offering, will be sufficient to meet our anticipated cash requirements for at least the next 12 months, we cannot assure you that we will generate sufficient revenues from commercial sales to adequately fund our operating needs or achieve or sustain profitability.

We will need to invest in our infrastructure in advance of increased demand for our services, and our failure to accurately forecast demand would have a negative impact on our business and our ability to achieve and sustain profitability.

In order to execute our business model, we need to invest in scaling our infrastructure, including hiring additional personnel, expanding our internal quality assurance program, and expanding laboratory capacity. We will also need to purchase additional equipment, some of which can take several months or more to procure, setup, and validate, and increase our software and computing capacity to meet increased demand. There is no assurance that any of these increases in scale, expansion of personnel, equipment, software, and computing capacities, or process enhancements will be successfully implemented, or that we will have adequate space in our laboratory facility to accommodate such required expansion. We expect that much of this growth will be in advance of increased demand for our services. Our current and projected future expense levels are to a large extent fixed and are largely based on our current investment plans and our estimates of future test volume. As a result, if revenues do not meet our expectations we may not be able to promptly adjust or reduce our spending to levels commensurate with our revenues. If we fail to generate demand commensurate with our infrastructure growth or if we fail to scale our infrastructure sufficiently in advance of demand to successfully meet such demand, our business, prospects, financial condition, and results of operations could be adversely affected.

As we commercialize additional services or products, we may need to incorporate new equipment, implement new technology systems and laboratory processes, or hire new personnel with different qualifications. Failure to manage this growth or transition could result in turnaround time delays, higher costs, declining service and/or 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 services, and could damage our reputation and the prospects for our business.

We have substantial customer concentration, with a limited number of customers accounting for a substantial portion of our 2018 revenues and accounts receivable.

Like other genomics profiling companies that sell to the pharmaceutical industry, we have customer concentration. We currently derive a significant portion of our revenues from the U.S. Department of Veterans Affairs (the "VA") Million Veteran Program (the "VA MVP"), which accounted for more than 49% of our revenues in 2018, and 59% of our revenues in the three months ended March 31, 2019. Our top five customers, including the VA MVP, accounted for 82% of our revenues in 2018 and 90% of our revenues for the three months ended March 31, 2019. There are inherent risks whenever a large percentage of revenues are concentrated with a limited number of customers. It is not possible for us to predict the future level of demand for our services that will be generated by these customers. In addition, revenues from our larger customers have historically fluctuated and may continue to fluctuate based on the commencement and completion of clinical trials or other projects, the timing of which may be affected by market conditions or other facts, some of which may be outside of our control. Further, while we have long-term contractual arrangements with certain of our customers, these customers are not required to purchase a minimum number of analyses. If any of these customers suspend or terminate clinical trials, receive less funding, experience declining or delayed sales, or otherwise chose to reduce or eliminate their use of our services, we could be pressured to reduce the prices we charge for our services which would have an adverse effect on our margins and financial position, and which would likely negatively affect our revenues and results of operations. In particular, if the VA MVP terminates our services for convenience, which it is permitted to do, such termination would have a material adverse effect on our revenues, cash position, and results of operations. Further, if our largest customers were to cease using or stop payment for our services, it would have a material adverse effect on our accounts receivable, increasing our credit risk. The failure of these customers to pay their balances, or any customer to pay future outstanding balances, would result in an operating expense and reduce our cash flows.

We currently derive a substantial portion of our revenues from DNA sequencing and data analysis services that we provide to our largest customer, the VA MVP. If the VA MVP's demand for and/or funding for our DNA sequencing and data analysis services is substantially reduced, our business, financial condition, operating results, and cash flows would be materially harmed.

We derive a substantial portion of our current and expected future revenues from sales of our DNA sequencing and data analysis services to the VA MVP. In September 2017, we entered into a one-year contract with three one-year option renewal periods with the VA for the VA MVP, pursuant to which we received orders from the VA MVP in September 2017 and 2018.

The VA MVP's orders for DNA sequencing and data analysis services are subject to the availability of funding, enrollment of veterans in the VA MVP study, and the VA MVP's continued demand for our services. We have no certainty that funding will be made available for our services. If the priorities of the VA, the VA MVP, or the U.S. government change, funding for our services may be limited or not available, and our business, financial condition, and operating results and cash flows would be materially harmed. The success of our business and our future operating results are significantly dependent on the VA MVP's receipt of funding for use of our services and the terms of our sales to the VA MVP, including the price per sample, the number of samples and the timing of the VA MVP's deliveries of samples.

If we cannot maintain our current customer relationships, or fail to acquire new customers, our revenue prospects will be reduced. Many of our customers are biopharmaceutical companies engaged in clinical trials of new drug candidates, which are expensive, can take many years to complete, and their outcome is inherently uncertain.

Our customers other than the VA MVP are primarily biopharmaceutical companies that use our services to support clinical trials. Our future success is substantially dependent on our ability to maintain our customer relationships and to establish new ones. Many factors have the potential to impact our customer relations,

including the type of support our customers and potential customers require and our ability to deliver it, our customers' satisfaction with our services, and other factors that may be beyond our control. Furthermore, our customers may decide to decrease or discontinue their use of our services due to changes in research and product development plans, failures in their clinical trials, financial constraints, or utilization of internal testing resources or tests performed by other parties, or other circumstances outside of our control.

We engage in conversations with customers regarding potential commercial opportunities on an ongoing basis in the event that one of these customers' drug candidates is approved. There is no assurance that any of these conversations will result in a commercial agreement, or if an agreement is reached, that the resulting relationship will be successful or that clinical studies conducted as part of the engagement will produce successful outcomes. Speculation in the industry about our existing or potential relationships with biopharmaceutical companies could be a catalyst for adverse speculation about us, our services, and our technology, which can adversely affect our reputation and our business. In addition, the termination of these relationships could result in a temporary or permanent loss of revenue.

Our customers' clinical trials are expensive, can take many years to complete, and their outcome is inherently uncertain. Failure can occur at any time during the clinical trial process. Product candidates in later stages of clinical trials may fail to show the desired safety and efficacy traits despite having progressed through pre-clinical studies and early clinical trials. Many of the biopharmaceutical companies that are our customers do not have products approved for commercial sale and are not profitable. These customers must continue to raise capital in order to continue their development programs and to potentially continue as our customers. If our customers' clinical trials fail or they are unable to raise sufficient capital to continue investing in their clinical programs, our revenues from these customers may decrease or cease entirely, and our business may be harmed. Furthermore, even if these customers have a drug approved for commercial sale, they may not choose to use our services as a companion diagnostic with their drug, thereby limiting our potential revenues.

The size of the potential future market for our services is an estimate and may be smaller than we believe.

Our estimate of the potential future market for our services is based on a number of internal and third-party estimates. While we believe these factors have historically provided and will continue to provide us with effective tools in estimating the total market for our services, these estimates may not be correct and the conditions supporting our estimates may change at any time, thereby reducing the predictive accuracy of these underlying factors. As a result, our estimates of the total addressable market for our services may prove to be incorrect. If the actual number of patients who would benefit from our services and the total addressable market for our services is smaller than we have estimated, our future growth could be adversely impacted. See the section titled "Market, Industry, and Other Data" for additional information regarding our estimates.

We rely on a limited number of suppliers, or in some cases, a sole supplier, for some of our laboratory instruments and materials, and we may not be able to find replacements or immediately transition to alternative suppliers should we need to do so.

We rely on a limited number of suppliers for sequencers and other equipment and materials that we use in our laboratory operations. For example, we rely on Illumina, Inc. ("Illumina") as the sole supplier of sequencers and various associated reagents, and as the sole provider of maintenance and repair services for these sequencers. Our master subcontractor agreement with Illumina is set to expire in August 2021, and our various pricing agreements with Illumina are set to expire on various dates from June 2019 to December 2022. Any disruption in Illumina's operations, or our inability to negotiate an extension to our agreements with Illumina on acceptable terms, or at all, could impact our supply chain and laboratory operations and our ability to conduct our business and generate revenue. Our suppliers could cease supplying these materials, reagents, and equipment at any time, or fail to provide us with sufficient quantities of materials or materials that meet our specifications. Our laboratory operations could be interrupted if we encounter delays or difficulties in securing equipment, materials, reagents, or sequencers, or if we cannot obtain an acceptable substitute. Any such interruption could significantly affect our business, financial condition, results of operations, and reputation.

We believe that there are only a few manufacturers other than Illumina that are currently capable of supplying and servicing the equipment necessary for our laboratory operations, including sequencers and various associated reagents. The use of equipment or materials provided by these replacement suppliers would require us to alter our laboratory operations. Transitioning to a new supplier 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 our tests. We cannot assure you that we will be able to secure alternative equipment, reagents, and other materials, and bring such equipment, reagents, and materials on line and revalidate them without experiencing interruptions in our workflow. If we encounter delays or difficulties in securing, reconfiguring, or revalidating the equipment and reagents we require for our services, our business, financial condition, results of operations, and reputation could be adversely affected.

In addition, the Device Master File that we have filed with the FDA, which is focused on the technology, quality management, and validation of our platform, specifically on its use for the development of personalized immuno-therapies, is predicated on our use of specified equipment and processes, including Illumina sequencers and related equipment. The detailed information in the Device Master File is not shared with our customers, but with our permission they can reference our FDA file number in their Investigational New Drug filings with the FDA. If we were required to transition to a new supplier of sequencers or certain other equipment or processes in our laboratory, our Device Master File would need to be replaced or updated, and until such time as that occurred, customers for which we deliver services after the transition would not be able to reference our Device Master File, which would cause us to lose a competitive advantage.

If our sole laboratory facility becomes damaged or inoperable, or we are required to vacate the facility, our ability to sell and provide our services and pursue our research and development efforts may be jeopardized.

We currently derive our revenues from our genomic analysis conducted in our laboratory. We do not have any clinical reference laboratory facilities other than our facility in Menlo Park, California. Our facilities and equipment could be harmed or rendered inoperable by natural or man-made disasters, including fires, earthquakes, flooding, and power outages, which may render it difficult or impossible for us to sell or perform our services for some period of time. Northern California has recently experienced serious fires and the San Francisco Bay Area is considered to lie in an area with earthquake risk. The inability to sell or to perform our diagnostic and other services, or the backlog of samples that could develop if our facility is inoperable for even a short period of time, may result in the loss of customers or harm to our reputation or relationships with scientific or clinical collaborators, and we may be unable to regain those customers or repair our reputation or such relationships in the future. Furthermore, our facilities and the equipment we use to perform our services and our research and development work could be costly and time-consuming to repair or replace.

Additionally, a key component of our research and development process involves using biological samples as the basis for the development of our services. In some cases, these samples are difficult to obtain. If the parts of our laboratory facility where we store these biological samples were damaged or compromised, our ability to pursue our research and development projects, as well as our reputation, could be jeopardized. We carry insurance for damage to our property and the disruption of our business, but this insurance may not be sufficient to cover all of our potential losses and may not continue to be available to us on acceptable terms, if at all.

Further, if our laboratory became inoperable, we would likely not be able to license or transfer our technology to another facility with the necessary qualifications, including state licensure and CLIA certification, under the scope of which our current and our planned future services could be performed. Even if we find a facility with such qualifications to perform our services, it may not be available to us on commercially reasonable terms.

Our internal information technology systems, or those of our third-party vendors, contractors, or consultants, may fail or suffer security breaches, loss or leakage of data, and other disruptions, which could result in a material disruption of our services, compromise sensitive information related to our business, or prevent us from accessing critical information, potentially exposing us to liability or otherwise adversely affecting our business.

We are increasingly dependent upon information technology systems, infrastructure, and data to operate our business. In the ordinary course of business, we collect, store, and transmit confidential information (including but not limited to intellectual property, proprietary business information, and personal information). It is critical that we do so in a secure manner to maintain the confidentiality and integrity of such confidential information. We also have outsourced elements of our operations to third parties, and as a result we manage a number of third-party vendors and other contractors and consultants who have access to our confidential information.

Despite the implementation of security measures, given the size and complexity of our internal information technology systems and those of our third-party vendors and other contractors and consultants, and the increasing amounts of confidential information that they maintain, our such information technology systems are potentially vulnerable to breakdown or other damage or interruption from service interruptions, system malfunction, natural disasters, terrorism, war, and telecommunication and electrical failures, as well as security breaches from inadvertent or intentional actions by our employees, third-party vendors, contractors, consultants, business partners, and/or other third parties, or from cyber-attacks by malicious third parties (including the deployment of harmful malware, ransomware, denial-of-service attacks, social engineering, and other means to affect service reliability and threaten the confidentiality, integrity, and availability of information), which may compromise our system infrastructure, or that of our third-party vendors and other contractors and consultants, or lead to data leakage. The risk of a security breach or disruption, particularly through cyber-attacks or cyber intrusion, including by computer hackers, foreign governments, and cyber terrorists, has generally increased as the number, intensity, and sophistication of attempted attacks and intrusions from around the world have increased. We may not be able to anticipate all types of security threats, and we may not be able to implement preventive measures effective against all such security threats. The techniques used by cyber criminals change frequently, may not be recognized until launched, and can originate from a wide variety of sources, including outside groups such as external service providers, organized crime affiliates, terrorist organizations, or hostile foreign governments or agencies. To the extent that any disruption or security breach were to result in a loss of, or damage to, our data or applications, or those of our third-party vendors and other contractors and consultants, or inappropriate disclosure of confidential or proprietary information, we could incur liability and reputational damage and the further development and commercialization of our services could be delayed. The costs related to significant security breaches or disruptions could be material and exceed the limits of the cybersecurity insurance we maintain against such risks. If the information technology systems of our third-party vendors and other contractors and consultants become subject to disruptions or security breaches, we may have insufficient recourse against such third parties and we may have to expend significant resources to mitigate the impact of such an event, and to develop and implement protections to prevent future events of this nature from occurring.

While we have not experienced any such system failure, accident, or security breach to date, and believe that our data protection efforts and our investment in information technology reduce the likelihood of such incidents in the future, we cannot assure you that our data protection efforts and our investment in information technology will prevent significant breakdowns, data leakages, breaches in our systems, or those of our third-party vendors and other contractors and consultants, or other cyber incidents that could have a material adverse effect upon our reputation, business, operations, or financial condition. For example, if such an event were to occur and cause interruptions in our operations, or those of our third-party vendors and other contractors and consultants, it could result in a material disruption of our programs and the development of our services and technologies could be delayed. Furthermore, significant disruptions of our internal information technology systems or those of our third-party vendors and other contractors and consultants, or security breaches could result in the loss, misappropriation, and/or unauthorized access, use, or disclosure of, or the prevention of access to, confidential information (including trade secrets or other intellectual property, proprietary business

information, and personal information), which could result in financial, legal, business, and reputational harm to us. For example, any such event that leads to unauthorized access, use, or disclosure of personal information, including personal information regarding our customers or employees, could harm our reputation directly, compel us to comply with federal and/or state breach notification laws and foreign law equivalents, subject us to mandatory corrective action, and otherwise subject us to liability under laws and regulations that protect the privacy and security of personal information, which could result in significant legal and financial exposure and reputational damages that could potentially have an adverse effect on our business.

Security breaches, loss of data, and other disruptions could compromise 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 collect and store sensitive data, including protected health information ("PHI"), personally identifiable information ("PII"), credit card and other financial information, intellectual property, and proprietary business information owned or controlled by ourselves or our customers, payors, and other parties. We manage and maintain our applications and data utilizing a combination of on-site systems and cloud-based data centers. We utilize external security and infrastructure vendors to manage parts of our data centers. We also communicate sensitive data, including patient data, electronically, and through relationships with multiple third-party vendors and their subcontractors. These applications and data encompass a wide variety of business-critical information, including research and development information, patient data, commercial information, and business and financial information. We face a number of risks relative to protecting this critical information, including loss of access risk, inappropriate use or disclosure, inappropriate modification, and the risk of our being unable to adequately monitor, audit, and modify our controls over our critical information. This risk extends to the third-party vendors and subcontractors we use to manage this sensitive data.

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 measures to protect sensitive data from unauthorized access, use or disclosure, our 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, manipulated, 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 the Health Insurance Portability and Accountability Act of 1996 ("HIPAA") and the Health Information Technology for Economic and Clinical Health Act ("HITECH"), and regulatory penalties. Notice of breaches must be made to affected individuals, the Secretary of the Department of Health and Human Services ("HHS"), and for extensive breaches, notice may need to be made to the media or state attorneys general. Such a notice could harm our reputation and our ability to compete. Although we have implemented security measures and a formal, dedicated enterprise security program to prevent unauthorized access to patient data, such data is currently accessible through multiple channels, and there is no guarantee we can protect our data from breach. Unauthorized access, loss, or dissemination could also damage our reputation or disrupt our operations, including our ability to conduct our analyses, deliver test results, process claims and appeals, provide customer assistance, conduct research and development activities, collect, process, and prepare company financial information, provide information about our tests and other patient and physician education and outreach efforts through our website, and manage the administrative aspects of our business.

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 significant civil monetary penalties and, in certain circumstances, criminal penalties with fines up to $250,000 per violation and/or imprisonment. In addition, numerous breach incidents could lead to possible penalties in excess of $1.68 million. A person who knowingly obtains or discloses individually identifiable health information in violation of HIPAA may face a criminal penalty of up to $50,000 and up to one-year 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.

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 personally identifiable information. These laws and regulations are not necessarily preempted by HIPAA, particularly if a state affords greater protection to individuals than HIPAA. Where state laws are more protective, we have to comply with the stricter provisions. 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 interplay of federal and state laws may be subject to varying interpretations by courts and government agencies, creating complex compliance issues for us and data we receive, use and share, potentially exposing us to additional expense, adverse publicity and liability. Further, as regulatory focus on privacy issues continues to increase and laws and regulations concerning the protection of personal information expand and become more complex, these potential risks to our business could intensify. Changes in laws or regulations associated with the enhanced protection of certain types of sensitive data, such as PHI or PII, for the treatment of genetic data, along with increased customer demands for enhanced data security infrastructure, could greatly increase our cost of providing our services, decrease demand for our services, reduce our revenues and/or 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 European Union (the "EU"), and elsewhere are often uncertain, contradictory and in flux. For example, the EU-wide General Data Protection Regulation (EU) 2016/679 ("GDPR") became applicable on May 25, 2018, replacing data protection laws issued by of each EU member state based on the Directive 95/46/EC (the "Directive"). Unlike the Directive, which needed to be transposed at a national level, the GDPR text is directly applicable in each EU member state, resulting in a more uniform application of data privacy laws across the EU. The GDPR imposes onerous accountability obligations requiring data controllers and processors to maintain a record of their data processing and policies. It requires data controllers to implement more stringent operational requirements for processors and controllers of personal data, including, for example, transparent and expanded disclosure to data subjects (in a concise, intelligible and easily accessible form) about how their personal information is to be used, imposes limitations on retention of information, increases requirements pertaining to health data and pseudonymized (i.e., key-coded) data, introduces mandatory data breach notification requirements and sets higher standards for data controllers to demonstrate that they have obtained valid consent for certain data processing activities. Fines for non-compliance with the GDPR will be significant—the greater of €20 million or 4% of global turnover. The GDPR provides that EU member states may introduce further conditions, including limitations, to make their own further laws and regulations limiting the processing of genetic, biometric or health data, which could limit our ability to collect, use and share European data, or could cause our compliance costs to increase, ultimately having an adverse impact on our business, and harm our business and financial condition. It is possible that these laws may be interpreted and applied in a manner that is inconsistent with our practices. If so, this could result in government-imposed fines or orders requiring that we change our practices, which could adversely affect our business. Further, the United Kingdom's vote in favor of exiting the EU, often referred to as Brexit, has created uncertainty with regard to data protection regulation in the United Kingdom. In particular, it is unclear whether the United Kingdom will enact data protection legislation equivalent to the GDPR and how data transfers to and from the United Kingdom will be regulated.

Compliance with U.S. and international data protection laws and regulations could cause us to incur substantial costs or require us to change our business practices and compliance procedures in a manner adverse to our business. Moreover, complying with these various laws could require us to take on more onerous obligations in our contracts, restrict our ability to collect, use and disclose data, or in some cases, impact our ability to operate in certain jurisdictions. We rely on our customers to obtain valid and appropriate consents from data

subjects whose genetic samples and data we process on such customers' behalf. Given that we do not obtain direct consent from such data subjects and we do not audit our customers to ensure that they have obtained the necessary consents required by law, the failure of our customers to obtain consents that are in compliance with applicable law could result in our own non-compliance with privacy laws. Such failure to comply with U.S. and international data protection laws and regulations could result in government enforcement actions (which could include civil or criminal penalties), private litigation and/or adverse publicity and could negatively affect our operating results and business. Claims that we have violated individuals' privacy rights, failed to comply with data protection laws, or breached our contractual obligations, even if we are not found liable, could be expensive and time consuming to defend, could result in adverse publicity and could have a material adverse effect on our business, financial condition and results of operations.

Our success depends on our ability to provide reliable, high-quality genomic data and analyses and to rapidly evolve to meet our customers' needs.

Errors, including if our tests fail to accurately detect gene variants, or mistakes, including if we fail to or incompletely or incorrectly identify the significance of gene variants, could have a significant adverse impact on our business. We classify variants in accordance with guidelines that are subject to change and subject to our interpretation. There can also be flaws in the databases, third-party tools, algorithms we use, and in the software that handle automated parts of our classification protocol. If we receive poor quality or degraded samples, our tests may be unable to accurately detect gene variants or we may fail to or incompletely or incorrectly identify the significance of gene variants, which could have a significant adverse impact on our business.

Inaccurate results or misunderstandings of, or inappropriate reliance on, the information we provide to our customers could lead to, or be associated with, side effects or adverse events in patients who use our tests, including treatment-related death, and could lead to termination of our services or claims against us. A product liability or professional liability claim could result in substantial damages and be costly and time-consuming for us to defend.

Although we maintain liability insurance, including for errors and omissions, and professional liability, we cannot assure you that our insurance would be sufficient to protect us from the financial impact of defending against these types of claims, or any judgments, fines or settlement costs arising out of any such claims. Any liability claim, including an errors and omissions 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 liability lawsuit could cause injury to our reputation or cause us to suspend sales of our tests or cause a suspension of our license to operate. The occurrence of any of these events could have an adverse effect on our business, reputation and results of operations.

If we cannot develop services and products to keep pace with rapid advances in technology, medicine and science, or experience delays in developing such services and products, our operating results and competitive position could be harmed.

In recent years, there have been numerous advances in technologies relating to the diagnosis and treatment of cancer. Several new cancer drugs have been approved, and a number of new drugs are in pre-clinical and clinical development. There have also been advances in methods used to identify patients likely to benefit from these drugs based on analysis of biomarkers. We must continuously develop new services and products, enhance any existing services, and avoid delays in such developments and enhancements to keep pace with evolving technologies on a timely and cost-effective basis. Our current services and our planned future services and products (such as our planned liquid biopsy test) could become obsolete unless we continually innovate and expand them to demonstrate benefit in the diagnosis, monitoring, or prognosis of patients with cancer. New cancer therapies typically have only a few years of clinical data associated with them, and much of that data may not be disclosed by the pharmaceutical company that conducted the clinical trials. This could limit our ability to develop services and products based on, for example, biomarker analysis related to the appearance or

development of resistance to those therapies. If we cannot adequately demonstrate the clinical utility of our services and our planned future services and products to new treatments, sales of our services could decline, which would have a material adverse effect on our business, financial condition, and results of operations.

We are researching and developing improvements to our tests and test features on a continuous basis, but we may not be able to make these improvements on a timely basis, and even if we do, we may not realize the benefits of these efforts in our financial results.

To remain competitive, we must continually research and develop improvements to our tests or test features. However, we cannot assure you that we will be able to develop and commercialize the improvements to our tests or test features on a timely basis. Our competitors may develop and commercialize competing or alternative tests and improvements faster than we are able to do so. In addition, we must expend significant time and funds in order to conduct research and development, further develop and scale our laboratory processes, and further develop and scale our infrastructure. We may never realize a return on investment on this effort and expense, especially if our improvements fail to perform as expected. If we are not able to realize the benefits of our efforts to improve our tests or test features, it could have an adverse effect on our business, financial condition, and results of operations.

Personalized cancer therapies represent new therapeutic approaches that could result in heightened regulatory scrutiny, delays in clinical development, or delays in or inability to achieve regulatory approval, commercialization, or payor coverage, any of which could adversely affect our business.

We currently work with certain companies developing personalized cancer therapies, and our future success will in part depend on our personalized cancer customers obtaining regulatory approval for and commercializing their product candidate. Because personalized cancer therapies represent a new approach to immunotherapy for the treatment of cancer and other diseases, developing and commercializing personalized cancer therapies is subject to a number of challenges.

Actual or perceived safety issues, including adoption of new therapeutics or novel approaches to treatment, may adversely influence the willingness of subjects to participate in clinical studies, or if approved by applicable regulatory authorities, of physicians to subscribe to the novel treatment mechanics. The FDA or other applicable regulatory authorities may ask for specific post-market requirements, and additional information regarding benefits or risks of our services may emerge at any time prior to or after regulatory approval.

Physicians, hospitals, and third-party payors often are slow to adopt new products, technologies, and treatment practices that require additional upfront costs and training. Physicians may not be willing to undergo training to adopt personalized cancer therapies, may decide that such therapies are too complex to adopt without appropriate training or not cost-efficient, and may choose not to administer these therapies. Based on these and other factors, hospitals and payors may decide that the benefits of personalized cancer therapies do not or will not outweigh their costs.

The loss of key members of our executive management team could adversely affect our business.

Our success in implementing our business strategy depends largely on the skills, experience, and performance of key members of our executive management team and others in key management positions, including John West, our Chief Executive Officer, Richard Chen, our Chief Scientific Officer, Clinton Musil, our Chief Business Officer, and Aaron Tachibana, our Chief Financial Officer. The collective efforts of each of these persons and others working with them as a team are critical to us as we continue to develop our technologies, services, products, and research and development programs. As a result of the difficulty in locating qualified new management, the loss or incapacity of existing members of our executive management team could adversely affect our operations. If we were to lose one or more of these key employees, we could experience difficulties in finding qualified successors, competing effectively, developing our technologies, and implementing our business

strategy. Each member of our executive management team has an employment agreement; however, the existence of an employment agreement does not guarantee retention of members of our executive management team and we may not be able to retain those individuals. We do not maintain "key person" life insurance on any of our employees.

In addition, we rely on collaborators, consultants, and advisors, including scientific and clinical advisors, to assist us in formulating our research and development and commercialization strategy. Our collaborators, consultants, and advisors are generally employed by employers other than us and may have commitments under agreements with other entities that may limit their availability to us.

The loss of a key employee, the failure of a key employee to perform in his or her current position, or our inability to attract and retain skilled employees could result in our inability to continue to grow our business or to implement our business strategy.

We rely on highly skilled personnel in a broad array of disciplines and if we are unable to hire, retain, or motivate these individuals, or maintain our corporate culture, we may not be able to maintain the quality of our services or grow effectively.

Our performance, including our research and development programs and laboratory operations, largely depends on our continuing ability to identify, hire, develop, motivate, and retain highly skilled personnel for all areas of our organization. Competition in our industry for qualified employees is intense, and we may not be able to attract or retain qualified personnel in the future, including bioinformatic scientists, bioinformatic engineers, software engineers, statisticians, variant curators, clinical laboratory scientists, and genetic counselors, due to the competition for qualified personnel among life science businesses, technology companies, as well as universities and public and private research institutions, particularly in the San Francisco Bay Area. All of our U.S. employees are at-will, which means that either we or the employee may terminate their employment at any time. In addition, our compensation arrangements, such as our equity award programs, may not always be successful in attracting new employees and retaining and motivating our existing employees, including due to movements in our stock price. If we are not able to attract and retain the necessary personnel to accomplish our business objectives, we may experience constraints that could adversely affect our ability to scale our business and support our research and development efforts and our laboratory operations. We believe that our corporate culture fosters innovation, creativity, and teamwork. However, as our organization grows, we may find it increasingly difficult to maintain the beneficial aspects of our corporate culture. This could negatively impact our ability to retain and attract employees and our future success.

We may not be able to manage our future growth effectively, which could make it difficult to execute our business strategy.

Our expected future growth could create a strain on our organizational, administrative, and operational infrastructure, including laboratory operations, quality control, customer service, marketing and sales, and management. We may not be able to maintain the quality of or expected turnaround times for our tests, or satisfy customer demand as our test volume grows. Our ability to manage our growth properly will require us to continue to improve our operational, financial, and management controls, as well as our reporting systems and procedures. As a result of our growth, our operating costs may escalate even faster than planned, and some of our internal systems may need to be enhanced or replaced. If we are unable to manage our growth effectively, it may be difficult for us to execute our business strategy and our business could be harmed.

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 for significant elements of our operations, including our laboratory information management system, our bioinformatics analytical software

systems, our database of information relating to genetic variations and their role in disease process, our clinical report systems, our billing systems, our business intelligence systems, our logistics and customer relationship systems, our customer-facing web-based software, our customer reporting, and our family history and risk assessment tools. 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, for example, systems handling human resources, financial reporting and controls, customer relationship management, regulatory compliance, and other infrastructure operations.

Although we invest substantially in the backup/restore, high-availability architecture, monitoring and reporting, documentation and preventive security controls of our systems, all information technology and telecommunications systems are vulnerable to damage from a variety of sources, including telecommunications or network failures, malicious or inadvertent human acts and natural disasters. Our servers are potentially vulnerable to physical or electronic break-ins, employee errors, 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 our information technology or telecommunications systems or those used by our third-party service providers could prevent us from conducting tests, preparing and providing reports to our customers, billing customers, collecting revenue, handling inquiries from our customers, conducting research and development activities, and managing the administrative aspects of our business. For example, in the first quarter of 2018, we experienced downtime in our information technology systems in connection with the adoption of certain new information technology, and experienced an adverse effect to our results of operations in the first and second quarters of 2018 were adversely affected as a result. 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.

Additionally, we have internally developed, and expect to continue to invest in and expand, proprietary informatics and software systems that are designed to manage the unique aspects and challenges of our genomics laboratory and on which we depend. Any disruption of failure of our internally developed informatics and software systems could have an adverse effect on our business.

Our employees may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements, which could cause significant liability for us and harm our reputation.

We are exposed to the risk of employee fraud or other misconduct, including intentional failures to comply with government regulations, including federal and state healthcare fraud and abuse laws and regulations, to misuse information, including patient information, and to report financial information or data accurately or disclose unauthorized activities to us. 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 have a code of conduct and ethics for our directors, officers and employees, but it is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business and results of operations, including the imposition of significant administrative, civil and criminal penalties, damages, fines, imprisonment, exclusion from government healthcare programs, contractual damages, refunding of payments received by us, reputational harm, additional reporting, or oversight obligations if we become subject to a corporate integrity agreement or other agreement to resolve allegations of non-compliance with the law and curtailment or restructuring of our operations. 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.

We may acquire businesses or assets, form joint ventures, or make investments in other companies or technologies that could harm our operating results, dilute our stockholders' ownership, or cause us to incur debt or significant expense.

As part of our business strategy, we may pursue acquisitions of complementary businesses or assets, as well as technology licensing arrangements. We may also pursue strategic alliances that leverage our core technology and industry experience to expand our offerings or distribution, or make investments in other companies. As an organization, we have limited experience with respect to acquisitions as well as the formation of strategic alliances and joint ventures. We may not identify or complete these transactions in a timely manner, on a cost-effective basis, or at all, and we may not realize the anticipated benefits of any acquisition, technology license, strategic alliance, joint venture or investment. In addition, we may not be able to find suitable partners or acquisition candidates, and we may not be able to complete such transactions on favorable terms, if at all. Any future acquisitions by us also could result in significant write-offs or the incurrence of debt and contingent liabilities, any of which could harm our operating results. If we make any acquisitions in the future, we may not be able to integrate these acquisitions successfully into our existing business, and we could assume unknown or contingent liabilities. Integration of an acquired company or business also may require management resources that otherwise would be available for ongoing development of our existing business.

To finance any acquisitions or investments, we may choose to raise additional funds. The various ways we could raise additional funds carry potential risks. See "—Our inability to raise additional capital on acceptable terms in the future may limit our ability to continue to operate our business and further expand our operations." Once we become a public company, if the price of our common stock is low or volatile, we may not be able to acquire other companies using stock as consideration. Alternatively, it may be necessary for us to raise additional funds for these activities through public or private financings. Additional funds may not be available on terms that are favorable to us, or at all.

We rely on commercial courier delivery services to transport specimens to our laboratory facility in a timely and cost-efficient manner, and if these delivery services are disrupted, our business would be harmed.

Our business depends on our ability to quickly and reliably deliver test results to our customers. Disruptions in delivery service, whether due to labor disruptions, bad weather, natural disaster, terrorist acts, or threats or for other reasons could adversely affect specimen integrity and our ability to process specimens in a timely manner and service our customers, and ultimately our reputation and our business. In addition, if we are unable to continue to obtain expedited delivery services on commercially reasonable terms, our operating results may be adversely affected.

Ethical, legal, and social concerns related to the use of genetic information could reduce demand for our tests.

Genetic testing has raised ethical, legal, and social concerns regarding privacy and the appropriate uses of the resulting information. Governmental authorities have, through the Genetic Information Nondisclosure Act, and could further, for social or other purposes, limit or regulate the use of genetic information or genetic testing or prohibit testing for genetic predisposition to certain conditions, particularly for those that have no known cure. Ethical and social concerns may also influence governmental authorities to deny or delay the issuance of patents for technology relevant to our business. Similarly, these concerns may lead patients to refuse to use, or clinicians to be reluctant to order, genetic tests even if permissible. These and other ethical, legal, and social concerns may limit market acceptance of our tests or reduce the potential markets for our tests, either of which could have an adverse effect on our business, financial condition, or results of operations.

The December 2017 tax reform law could adversely affect our business and financial condition.

On December 22, 2017, President Trump signed into law comprehensive tax legislation (the "Tax Cuts and Jobs Act") that significantly revised the Internal Revenue Code of 1986, as amended (the "Code"). The Tax Cuts

and Jobs Act, among other things, contained significant changes to corporate taxation, including reduction of the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%, limitation of the tax deduction for interest expense to 30% of adjusted taxable income (except for certain small businesses), limitation of the deduction for net operating losses incurred after 2017 to 80% of current year taxable income and elimination of net operating loss carrybacks, one-time taxation of offshore earnings at reduced rates regardless of whether they are repatriated, elimination of U.S. tax on foreign earnings (subject to certain important exceptions), immediate deductions for certain new investments instead of deductions for depreciation expense over time, and modifying or repealing many business deductions and credits. Notwithstanding the reduction in the corporate income tax rate, the overall impact of the Tax Cuts and Jobs Act is uncertain and our business and financial condition could be adversely affected. In addition, it is uncertain if and to what extent various states will conform to the Tax Cuts and Jobs Act. The impact of this tax reform on holders of our common stock is also uncertain and could be adverse. We urge our stockholders to consult with their legal and tax advisors with respect to this legislation and the potential tax consequences of investing in or holding our common stock.

Our effective tax rate may fluctuate, and we may incur obligations in tax jurisdictions in excess of accrued amounts.

We are subject to taxation in numerous U.S. states and territories. As a result, our effective tax rate is derived from a combination of applicable tax rates in the various places that we operate. In preparing our financial statements, we estimate the amount of tax that will become payable in each of such places. Nevertheless, our effective tax rate may be different than experienced in the past due to numerous factors, including passage of the Tax Cuts and Jobs Act, changes in the mix of our profitability from state to state, the results of examinations and audits of our tax filings, our inability to secure or sustain acceptable agreements with tax authorities, changes in accounting for income taxes and changes in tax laws. Any of these factors could cause us to experience an effective tax rate significantly different from previous periods or our current expectations and may result in tax obligations in excess of amounts accrued in our financial statements.

Risks Related to Government Regulation

Our tests may be subject to regulatory action if regulatory agencies determine that our tests do not appropriately comply with statutory and regulatory requirements enforced by the U.S. Food and Drug Administration, and/or CLIA requirements for quality laboratory testing.

The laws and regulations governing the marketing of clinical laboratory tests are extremely complex and in many instances there are no significant regulatory or judicial interpretations of these laws and regulations. The Federal Food, Drug and Cosmetic Act (the “FDC Act”) 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. Some of our tests may be considered by the FDA to be in vitro diagnostic products that are subject to regulation as medical devices. Among other things, pursuant to the FDC Act and its implementing regulations, the FDA regulates the research, testing, manufacturing, safety, labeling, storage, recordkeeping, premarket clearance or approval, marketing and promotion, and sales and distribution of medical devices in the United States to ensure that medical products distributed domestically are safe and effective for their intended uses. In addition, the FDA regulates the import and export of medical devices.

Although the FDA has statutory authority to assure that medical devices are safe and effective for their intended uses, the FDA has generally exercised its enforcement discretion and not enforced applicable regulations with respect to laboratory developed tests (“LDTs”), which are a subset of in vitro diagnostic devices that are intended for clinical use and designed, manufactured and used entirely within a single laboratory. We currently market our tests as LDTs and, therefore, we believe that they are not currently subject to the FDA’s enforcement of its medical device regulations and the applicable FDC Act provisions. Despite the FDA’s historic

enforcement discretion policy with respect to LDTs, in November 2017, the FDA finalized a classification order setting out the regulatory requirements that apply to certain genetic health risk tests and revised a separate classification order exempting certain carrier screening tests from FDA premarket clearance and approval requirements when certain regulatory requirements are met. None of our tests comply with these classification orders because we market our tests as LDTs that are subject to the FDA's policy of enforcement discretion. However, the FDA may find that our tests do not fall within the definition of an LDT, and may determine that our tests are subject to the FDA's enforcement of its medical device regulations, including the recent classification orders, and the applicable FDC Act provisions. While we believe that we are currently in material compliance with applicable laws and regulations, we cannot assure you that the FDA or other regulatory agencies would agree with our determination, and a determination that we have violated these laws, or a public announcement that we are being investigated for possible violations of these laws, could adversely affect our business, prospects, results of operations or financial condition. If the FDA determines that our tests are subject to enforcement as medical devices, we could be subject to enforcement action, including administrative and judicial sanctions, and additional regulatory controls and submissions for our tests, all of which could be burdensome. See "—Failure to comply with federal, state, and foreign laboratory licensing requirements and the applicable requirements of the FDA or any other regulatory authority, could cause us to lose the ability to perform our tests, experience disruptions to our business or become subject to administrative or judicial sanctions."

Moreover, LDTs may in the future become subject to more onerous regulation by the FDA. A significant change in any of the laws, regulations or policies may require us to change our business model in order to maintain regulatory compliance. At various times since 2006, the FDA has issued documents outlining its intent to require varying levels of FDA oversight of many types of LDTs. In October 2014, the FDA issued two non-binding draft guidance documents that set forth a proposed risk-based regulatory framework that would apply varying levels of FDA oversight to LDTs. The FDA indicated that it did not intend to implement its proposed framework until the draft guidance documents are finalized. The FDA was expected to finalize its proposal for the oversight of LDTs before the end of 2016, but in November 2016, the FDA announced that it would halt finalizing of the guidance documents and continue to work with stakeholders, the incoming administration and Congress on the approach to LDT regulation. This announcement was followed by the issuance of an information discussion paper on January 13, 2017, in which the FDA outlined a substantially revised "possible approach" to the oversight of LDTs. The discussion paper explicitly states that it is not a final version of the 2014 draft guidance and that it is not enforceable and does not represent the FDA's "formal position." It is unclear at this time if or when the FDA will finalize its plans to end enforcement discretion for LDTs, and even then, whether the new regulatory requirements are expected to be phased-in over time. However, the FDA may decide to regulate certain LDTs on a case-by-case basis at any time, which could result in delay or additional expense in offering our tests and tests that we may develop in the future.

Legislative proposals addressing oversight of genetic testing and LDTs have been introduced in previous Congresses, and we expect that new legislative proposals will be introduced from time to time in the future. We cannot provide any assurance that FDA regulation, including pre-market review, will not be required in the future for our tests, whether through finalization of guidance issued by the FDA, new enforcement policies adopted by the FDA or new legislation enacted by Congress. It is possible that legislation will be enacted into law or guidance could be issued by the FDA which may result in increased regulatory burdens for us to continue to offer our tests or to develop and introduce new tests. This legislative and regulatory uncertainty exposes us to the possibility of enforcement action or additional regulatory controls and submissions for our tests, both of which could be burdensome. We cannot be certain that the FDA will not enact rules or guidance documents which could impact our ability to purchase certain materials necessary for the performance of our tests, such as products labeled for research use only. Should any of the reagents obtained by us from suppliers and used in conducting our tests be affected by future regulatory actions, our business could be adversely affected by those actions, including increasing the cost of testing or delaying, limiting or prohibiting the purchase of reagents necessary to perform testing.

Additionally, the Centers for Medicare & Medicaid Services ("CMS"), and certain state agencies regulate the performance of LDTs (as authorized under CLIA and state law, respectively). Our tests are developed in compliance with CLIA requirements. However, if our laboratory fails to comply with the prescribed quality requirements for laboratory testing or other requirements for CLIA, we could lose CLIA certification. That in turn would impact our ability to operate our laboratory and provide results to our customers, which could negatively impact our business operations.

If the FDA determines that our services are subject to enforcement as medical devices, we could incur substantial costs and time delays associated with satisfying statutory and regulatory requirements such as pre-market clearance or approval and we could incur additional expense in offering our tests and tests that we may develop in the future.

If the FDA determines that our tests and associated software do not fall within the definition of an LDT, or there are regulatory or legislative changes, we may be required to obtain premarket clearance for our tests and associated software under Section 510(k) of the FDC Act or approval of a premarket approval application ("PMA"). We would also be subject to ongoing regulatory requirements such as registration and listing requirements, medical device reporting requirements, and quality control requirements. If our tests are considered medical devices not subject to enforcement discretion, the regulatory requirements to which our tests are subject would depend on the FDA's classification of our tests. The FDA has issued regulations classifying over 1,700 different generic types of medical devices into one of three regulatory control categories (Class I, Class II, or Class III) depending on the degree of regulation that the FDA finds necessary to provide reasonable assurance of their safety and effectiveness. The class into which a device is placed determines the requirements that a medical device manufacturer must meet both pre- and post-market.

Generally, Class I devices do not require premarket authorization, but are subject to a comprehensive set of regulatory authorities referred to as general controls. Class II devices, in addition to general controls, generally require special controls and premarket clearance through the submission of a section 510(k) premarket notification. Class III devices are subject to general controls and special controls, and also require premarket approval prior to commercial distribution, which is a more rigorous process than premarket clearance. Under the FDC Act, a device that is first marketed after May 28, 1976 is by default a Class III device requiring premarket approval unless it is within a type of generic device class that has been classified as Class I or Class II. Even if a device falls under an existing Class II, non-exempt, device classification, the product must also be shown to be "substantially equivalent" to a legally marketed predicate device through submission of a section 510(k) premarket notification. If after reviewing a firm's 510(k) premarket notification, the FDA determines that a device is not substantially equivalent to a legally marketed predicate device, the new device is classified into Class III, requiring premarket approval. It is possible for a manufacturer to obtain a Class I or Class II designation without an appropriate predicate by submitting a *de novo* request for reclassification.

The process for submitting a 510(k) premarket notification and receiving FDA clearance usually takes from three to twelve months, but it can take significantly longer and clearance is never guaranteed. The process for submitting and obtaining FDA approval of a PMA is much more costly, lengthy, and uncertain. It generally takes from one to three years or even longer and approval is not guaranteed. PMA approval typically requires extensive clinical data and can be significantly longer, more expensive and more uncertain than the 510(k) clearance process. Despite the time, effort and expense expended, there can be no assurance that a particular device ultimately will be cleared or approved by the FDA through either the 510(k) clearance process or the PMA process on a timely basis, or at all.

If our tests are considered medical devices not subject to enforcement discretion, one classification regulation that could be relevant to one or more of our tests is a recently finalized classification for genetic health risk ("GHR"), assessment tests. On April 6, 2017, in response to a *de novo* request for reclassification submitted by another company, the FDA issued an order classifying genetic tests known as genetic health risk assessment systems ("GHR tests") as Class II devices subject to premarket notification and specified special controls

requirements. On November 7, 2017, the FDA codified this classification at 21 C.F.R. § 866.5950. If our tests are considered medical devices that are not subject to enforcement discretion and one or more of our tests is considered to fall under the 21 C.F.R. § 866.5950 classification regulation for GHR tests, or under another Class II classification that is subject to a premarket notification requirement, we would be required to obtain marketing clearance for such tests. Further, if considered to fall under the 21 C.F.R. § 866.5950 classification for GHR tests, our tests would be required to adhere to specified special controls, such as labeling and testing specifications and information about the test to be posted on the manufacturer's website. Although the FDA has also issued a proposal for a simplified path to market GHR tests that would amend the classification regulation at 21 C.F.R. § 886.5950 such that manufacturers would only be subject to a one-time marketing review to ensure that they meet the applicable FDA requirements prior to selling GHR tests in the market, the FDA has yet to finalize this proposal, and we do not know if and when finalization will occur. Even if the FDA finalizes the proposed limited exemption for GHR tests, if any of our current or pipeline tests are not considered by the FDA to be GHR tests or do not qualify for the limited exemption (if and when finalized), or if any of our tests fall under a different non-exempt classification or are unclassified, we could be required to obtain 510(k) clearance or approval of a PMA for such test in the future.

If premarket review of our tests is required, the premarket review process may involve, among other things, successfully completing additional clinical trials. If we are required to conduct premarket clinical trials, whether using prospectively acquired samples or archival samples, delays in the commencement or completion of clinical testing could significantly increase our product development costs, delay commercialization of any future products, and interrupt sales of our current products. Many of the factors that may cause or lead to a delay in the commencement or completion of clinical trials may also ultimately lead to delay or denial of regulatory clearance or approval. The commencement of clinical trials may be delayed due to insufficient patient enrollment, which is a function of many factors, including the size of the patient population, the concerns around genetic testing, the nature of the protocol, the proximity of patients to clinical sites and the eligibility criteria for the clinical trial.

If we are required to conduct clinical trials, we and any third-party contractors we engage would be required to comply with good clinical practices ("GCPs"), which are regulations and guidelines enforced by the FDA, for products in clinical development. The FDA enforces these GCPs through periodic inspections of trial sponsors, principal investigators and trial sites. If we or any third-party contractor fails to comply with applicable GCPs, the clinical data generated in clinical trials may be deemed unreliable and the FDA may require us to perform additional clinical trials before clearing or approving our marketing applications. A failure to comply with these regulations may require us to repeat clinical trials, which would delay the regulatory clearance or approval process. In addition, if these parties do not successfully carry out their contractual duties or obligations or meet expected deadlines, or if the quality, completeness or accuracy of the clinical data they obtain is compromised due to the failure to adhere to our clinical protocols or for other reasons, our clinical trials may have to be extended, delayed or terminated. Many of these factors would be beyond our control. We may not be able to enter into replacement arrangements without undue delays or considerable expenditures. If there are delays in testing or approvals as a result of the failure to perform by third parties, our research and development costs would increase, and we may not be able to obtain regulatory clearance or approval for our tests. In addition, we may not be able to establish or maintain relationships with these parties on favorable terms, if at all. Each of these outcomes would harm our ability to market our tests or to achieve or sustain profitability.

The FDA requires medical device manufacturers to comply with, among other things, current good manufacturing practices for medical devices, set forth in the Quality System Regulation at 21 C.F.R. Part 820, which requires manufacturers to follow elaborate design, testing, control, documentation and other quality assurance procedures during the manufacturing process; the medical device reporting regulation, which requires that manufacturers report to the FDA if their device or a similar device they market 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; labeling regulations, including the FDA's general prohibition against promoting products for unapproved or "off-label" uses; the reports of corrections and removals regulation, which requires manufacturers to report to the FDA if a device correction or removal was initiated to reduce a risk to

health posed by the device or to remedy a violation of the FDC Act caused by the device which may present a risk to health; and the establishment registration and device listing regulation.

Moreover, there can be no assurance that any cleared or approved labeling claims will be consistent with our current claims or adequate to support continued adoption of our products. If premarket review is required for some or all of our products, the FDA may require that we stop selling our products pending clearance or approval, which would negatively impact our business. Even if our products are allowed to remain on the market prior to clearance or approval, demand for our products may decline if there is uncertainty about our products, if we are required to label our products as investigational by the FDA, or if the FDA limits the labeling claims we are permitted to make for our products. As a result, we could experience significantly increased development costs and a delay in generating additional revenues from our services, or from other services or products now in development.

In addition, any clearance or approval we obtain for our products may contain requirements for costly post-market testing and surveillance to monitor the safety or efficacy of the product. The FDA has broad post-market enforcement powers, and if unanticipated problems with our products arise, or if we or our suppliers fail to comply with regulatory requirements following FDA clearance or approval, we may become subject to enforcement actions such as:

- restrictions on manufacturing processes;
- restrictions on product marketing;
- warning letters;
- withdrawal or recall of products from the market;
- refusal to approve pending PMAs, 510(k)s, or supplements to approved PMAs or cleared 510(k)s that we submit;
- fines, restitution or disgorgement of profits or revenue;
- suspension or withdrawal of regulatory clearances or approvals;
- limitation on, or refusal to permit, import or export of our products;
- product seizures;
- injunctions; or
- imposition of civil or criminal penalties.

Moreover, the FDA strictly regulates the promotional claims that may be made about medical devices. In particular, a medical device may not be promoted for uses that are not approved by the FDA as reflected in the device's approved labeling. However, companies may share truthful and not misleading information that is otherwise consistent with the product's FDA approved labeling. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label uses may be subject to significant civil, criminal and administrative penalties.

Failure to comply with federal, state, and foreign laboratory licensing requirements and the applicable requirements of the FDA or any other regulatory authority, could cause us to lose the ability to perform our tests, experience disruptions to our business, or become subject to administrative or judicial sanctions.

We are subject to CLIA, a federal law that regulates clinical laboratories that perform testing on specimens derived from humans for the purpose of providing information for the diagnosis, prevention, or treatment of disease. CLIA regulations establish specific standards with respect to personnel qualifications, facility

administration, proficiency testing, quality control, quality assurance, and inspections. We have a current CLIA certificate to conduct our tests at our laboratory in Menlo Park, California. To renew this certificate, we are subject to survey and inspection every two years. Moreover, CLIA inspectors may make random inspections of our clinical reference laboratory.

We are also required to maintain a license to conduct testing in California. California laws establish standards for day-to-day operation of our clinical reference laboratory in Menlo Park, including the training and skills required of personnel and quality control. Several other states in which we operate also require that we hold licenses to test specimens from patients in those states, under certain circumstances. For example, our clinical reference laboratory is required to be licensed on a product-specific basis by New York as an out-of-state laboratory, and our products, as LDTs, must be approved by the New York State Department of Health (the "NYDOH") on a product-by-product basis before they are offered in New York. We are subject to periodic inspection by the NYDOH and are required to demonstrate ongoing compliance with NYDOH regulations and standards. To the extent NYDOH identified any non-compliance and we are unable to implement satisfactory corrective actions to remedy such non-compliance, the State of New York could withdraw approval for our tests. Additionally, states such as Maryland, Pennsylvania, and Rhode Island may also require us to maintain out-of-state licenses. Other states may have similar requirements or may adopt similar requirements in the future. Although we have obtained licenses from states where we believe we are required to be licensed, we may become aware of other states that require out-of-state laboratories to obtain licensure in order to accept specimens from the state, and it is possible that other states currently have such requirements or will have such requirements in the future. We may also be subject to regulation in foreign jurisdictions as we seek to expand international utilization of our tests or such jurisdictions adopt new licensure requirements, which may require review of our tests in order to offer them or may have other limitations such as restrictions on the transport of human blood necessary for us to perform our tests that may limit our ability to make our tests available outside of the United States. Complying with licensure requirements in new jurisdictions may be expensive and/or time-consuming, may subject us to significant and unanticipated delays, or may be in conflict with other applicable requirements.

Failure to comply with applicable clinical laboratory licensure requirements may result in a range of enforcement actions, including license suspension, limitation, or revocation, directed plan of action, onsite monitoring, civil monetary penalties, and criminal sanctions as well as significant adverse publicity. Any sanction imposed under CLIA, its implementing regulations or state or foreign laws or regulations governing clinical laboratory licensure, or our failure to renew our CLIA certificate, a state or foreign license or accreditation, could have a material adverse effect on our business, financial condition and results of operations. Even if we were able to bring our laboratory back into compliance, we could incur significant expenses and potentially lose revenues in doing so.

Although we market our tests as LDTs that are currently subject to the FDA's exercise of enforcement discretion, if we fail to operate within the conditions of that exercise of enforcement discretion, or if any of our products otherwise fail to comply with FDA regulatory requirements as enforced, we would be subject to the applicable requirements of the FDC Act and the FDA's implementing regulations. The FDA is empowered to impose sanctions for violations of the FDC Act and the FDA's implementing regulations, including warning letters, civil and criminal penalties, injunctions, product seizure or recall, import bans, restrictions on the conduct of our operations and total or partial suspension of production. Any of the aforementioned sanctions could cause reputational damage, undermine our ability to maintain and increase our revenues, and harm our business, financial condition, and results of operations. In particular, if we or the FDA discover that any of our products have defects that call into question the accuracy of their results, we may be required to undertake a retest of all results and analyses provided during the period relevant to the defect, or recall the affected products. The direct costs incurred in connection with such a recall in terms of management time, administrative and legal expenses and lost revenue, together with the indirect costs to our reputation could harm our business, financial condition and results of operations, and our ability to execute our business strategy. While we believe that we are currently in material compliance with applicable laws and regulations as currently enforced, the FDA or other regulatory

agencies may not agree, and a determination that we have violated these laws or a public announcement that we are being investigated for possible violations of these laws could adversely affect our business, financial condition, results of operations, and prospects.

Complying with numerous statutes and regulations pertaining to our business is an expensive and time- consuming process, and any failure to comply could result in substantial penalties.

Our operations may be subject to other extensive federal, state, local, and foreign laws and regulations, all of which are subject to change. These laws and regulations currently include, among others:

- the federal Anti-Kickback Statute, which prohibits knowingly and willfully offering, paying, soliciting, or receiving remuneration, directly or indirectly, overtly or covertly, in cash or in kind, in return for or to induce such person to refer an individual, or to purchase, lease, order, arrange for, or recommend purchasing, leasing or ordering, any good, facility, item or service that is reimbursable, in whole or in part, under a federal healthcare program. A person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation. In addition, the government may assert that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the false claims statutes;
- the federal Stark physician self-referral law, which prohibits a physician from making a referral for certain designated health services covered by the Medicare program, including laboratory and pathology services, if the physician or an immediate family member has a financial relationship with the entity providing the designated health services, and prohibits that entity from billing or presenting a claim for the designated health services furnished pursuant to the prohibited referral, unless an exception applies. Failure to refund amounts received as a result of a prohibited referral on a timely basis may constitute a false or fraudulent claim under the False Claims Act;
- the "Anti-Markup Rule" and similar state and similar state laws, among other things, prohibits a physician or supplier billing the Medicare program from marking up the price of a purchased diagnostic service performed by another laboratory or supplier that does not "share a practice" with the billing physician or supplier. Penalties may apply to the billing physician or supplier if Medicare or another payer is billed at a rate that exceeds the performing laboratory's charges to the billing physician or supplier, and the performing laboratory could be at risk under false claims laws, described below, for causing the submission of a false claim;
- the federal civil and criminal false claims laws, including the False Claims Act, which impose liability on any person or entity that, among other things, knowingly presents, or causes to be presented, a false or fraudulent claim for payment to the federal government. These laws can apply to entities that provide information on coverage, coding, and reimbursement of their products and assistance with obtaining reimbursement to persons who bill payors. Private individuals can bring False Claims Act "qui tam" actions, on behalf of the government and such individuals, commonly known as "whistleblowers," may share in amounts paid by the entity to the government in fines or settlement;
- the federal Civil Monetary Penalties Law, which prohibits, among other things, the offering or transfer of remuneration to a Medicare or state healthcare program beneficiary if the person knows or should know it is likely to influence the beneficiary's selection of a particular provider, practitioner, or supplier of services reimbursable by Medicare or a state healthcare program, unless an exception applies;
- the federal Physician Payments Sunshine Act, which requires certain manufacturers of drugs, biologicals, and medical devices or supplies that require premarket approval by or notification to the FDA, and for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program ("CHIP") to report annually to CMS information related to (i) payments and other transfers of value to physicians and teaching hospitals, and (ii) ownership and investment interests held by physicians and their immediate family members;

- the HIPAA fraud and abuse provisions, which created federal civil and criminal statutes that prohibit, among other things, defrauding healthcare programs, willfully obstructing a criminal investigation of a healthcare offense and falsifying or concealing a material fact or making any materially false statements in connection with the payment for healthcare benefits, items or services. Similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;
- the Eliminating Kickbacks in Recovery Act of 2018 ("EKRA"), which prohibits payments for referrals to recovery homes, clinical treatment facilities, and laboratories. EKRA's reach extends beyond federal health care programs to include private insurance (i.e., it is an "all payer" statute);
- other federal and state fraud and abuse laws, such as anti-kickback laws, prohibitions on self-referral, fee-splitting restrictions, insurance fraud laws, prohibitions on the provision of tests at no or discounted cost to induce physician or patient adoption, and false claims acts, which may extend to services reimbursable by any payer, including private insurers;
- the prohibition on reassignment of Medicare claims, which, subject to certain exceptions, precludes the reassignment of Medicare claims to any other party;
- state laws that prohibit other specified practices, such as billing physicians for testing that they order; waiving coinsurance, copayments, deductibles, and other amounts owed by patients; billing a state Medicaid program at a price that is higher than what is charged to one or more other payors employing, exercising control over, licensed professionals in violation of state laws prohibiting corporate practice of medicine and other professions, and prohibitions against the splitting of professional fees with licensed professionals; and
- similar foreign laws and regulations that apply to us in the countries in which we operate or may operate in the future.

As a clinical laboratory, our business practices may face additional scrutiny from government regulatory agencies such as the Department of Justice, the HHS Office of Inspector General (the "OIG") and CMS. Certain arrangements between clinical laboratories and referring physicians have been identified in fraud alerts issued by the OIG as implicating the Anti-Kickback Statute. The OIG has stated that it is particularly concerned about these types of arrangements because the choice of laboratory, as well as the decision to order laboratory tests, typically are made or strongly influenced by the physician, with little or no input from patients. Moreover, the provision of payments or other items of value by a clinical laboratory to a referral source could be prohibited under the Stark Law unless the arrangement meets all criteria of an applicable exception. The government has been active in enforcement of these laws as they apply to clinical laboratories.

The growth of our business and our expansion outside of the United States may increase the potential of violating these laws or our internal policies and procedures. The risk of our being found in violation of these or other laws and regulations is further increased by the fact that many have not been fully interpreted by the regulatory authorities or the courts, and their provisions are open to a variety of interpretations. Any action brought against us for violation of these or other laws or regulations, even if we successfully defend against it, could cause us to incur significant legal expenses and reputational harm and divert our management's attention from the operation of our business. If our operations are found to be in violation of any of these laws and regulations, we may be subject to any applicable penalty associated with the violation, including significant administrative, civil and criminal penalties, damages, fines, imprisonment, exclusion from participation in federal healthcare programs, refunding of payments received by us, integrity oversight and reporting obligations, and curtailment or cessation of our operations. Any of the foregoing consequences could seriously harm our business and our financial results.

If we decide to grow our business by developing in vitro diagnostic tests, we may be subject to reimbursement challenges.

The coverage and reimbursement status of newly approved or cleared laboratory tests is uncertain. If we develop in vitro diagnostic tests and decide to seek reimbursement, and if such tests are inadequately covered by insurance and ineligible for such reimbursement, this could limit our ability to market any such future tests. The commercial success of future products in both domestic and international markets may depend in part on the availability of coverage and adequate reimbursement from third-party payors, including government payors, such as the Medicare and Medicaid programs, managed care organizations, and other third-party payors. The government and other third-party payors are increasingly attempting to contain health care costs by limiting both insurance coverage and the level of reimbursement for new diagnostic tests. As a result, they may not cover or provide adequate payment for any future in vitro diagnostic tests that we develop. These payors may conclude that our products are less safe, less effective, or less cost-effective than existing or later-introduced products. These payors may also conclude that the overall cost of using one of our tests exceeds the overall cost of using a competing test, and third-party payors may not approve any future in vitro diagnostic tests we develop for insurance coverage and adequate reimbursement.

We could be adversely affected by violations of the Foreign Corrupt Practices Act of 1977, as amended (the "FCPA"), and other worldwide anti-bribery laws.

We are 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. Other U.S. companies in the medical device and pharmaceutical fields have faced criminal penalties under the FCPA for allowing their agents to deviate from appropriate practices in doing business with these individuals. We are also subject to similar anti-bribery laws in the jurisdictions in which we 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, as a result, we cannot assure you that we would not be required in the future to alter one or more of our practices to be in compliance with these laws or any changes in these laws or the interpretation thereof. 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 incur severe penalties, including criminal and civil penalties, disgorgement, and other remedial measures.

Expansion into international markets would subject us to increased regulatory oversight and regulatory, economic, social and political uncertainties, which could cause a material adverse effect on our business, financial position, and results of operations.

We may in the future expand our business and operations into international jurisdictions in which we have limited operating experience, including with respect to seeking regulatory approvals and marketing and selling products and services. If we expand internationally, our operations in these jurisdictions may be adversely affected by general economic conditions and economic and fiscal policy, including changes in exchange rates and controls, interest rates and taxation policies, increased government regulation, social stability and political, economic or diplomatic developments in the future. Certain jurisdictions have, from time to time, experienced instances of civil unrest and hostilities, both internally and with neighboring countries. Rioting, military activity, terrorist attacks, or armed hostilities could cause our operations in such jurisdictions to be adversely affected or suspended. We generally do not have insurance for losses and interruptions caused by terrorist attacks, military conflicts and wars. In addition, anti-bribery and anti-corruption laws may conflict with some local customs and practices in foreign jurisdictions. Our international operations may subject us to heightened scrutiny under the FCPA, the UK Bribery Act and similar anti-bribery laws, and could subject us to liability under such laws despite our best efforts to comply with such laws. As a result of our policy to comply with the FCPA, the UK Bribery Act and similar anti-bribery laws, we may be at a competitive disadvantage to competitors that are not subject to,

or do not comply with, such laws. Further, notwithstanding our compliance programs, there can be no assurances that our policies will prevent our employees or agents from violating these laws or protect us from any such violations. Additionally, we cannot predict the nature, scope or impact of any future regulatory requirements that may apply to our international operations or how foreign governments will interpret existing or new laws. Alleged, perceived or actual violations of any such existing or future laws by us or due to the acts of others, may result in criminal or civil sanctions, including contract cancellations or debarment, and damage to our reputation, any of which could have a material adverse effect on our business.

Changes in health care policy could increase our costs, decrease our revenues, and impact sales of and reimbursement for our tests.

In March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act (the "ACA"), became law. This law substantially changed the way health care is financed by both commercial payers and government payers, and significantly impacts our industry. The ACA contains a number of provisions that are expected to impact the business and operations of our customers, some of which in ways we cannot currently predict, including those governing enrollment in state and federal health care programs, reimbursement changes and fraud and abuse, which will impact existing state and federal health care programs and will result in the development of new programs.

Among other things, the ACA:

- imposed an annual excise tax of 2.3% on any entity that manufactures or imports medical devices offered for sale in the United States, with limited exceptions, although the effective rate paid may be lower. Under the Consolidated Appropriations Act of 2016, the excise tax was suspended through December 31, 2017, and under the continuing resolution on appropriations for fiscal year 2018, signed by President Trump on January 22, 2018, was further suspended through December 31, 2019;
- expanded eligibility criteria for Medicaid programs by, among other things, allowing states to offer Medicaid coverage to additional individuals and by adding new mandatory eligibility categories for individuals with income at or below 133% of the federal poverty level, thereby potentially increasing manufacturers' Medicaid rebate liability;
- established a new Patient-Centered Outcomes Research Institute to oversee and identify priorities in comparative clinical efficacy research in an effort to coordinate and develop such research; and
- established a Center for Medicare & Medicaid Innovation at CMS to test innovative payment and service delivery models to lower Medicare and Medicaid spending.

Some of the provisions of the ACA have yet to be implemented, and there have been judicial and Congressional challenges to certain aspects of the ACA, as well as recent efforts by the Trump administration to repeal or replace certain aspects of the ACA. Since January 2017, President Trump has signed two Executive Orders and other directives to delay the implementation of certain requirements of the ACA. Concurrently, Congress has considered legislation that would repeal or repeal and replace all or part of the ACA. While Congress has not passed comprehensive repeal legislation, it has enacted laws that modify certain provisions of the ACA such as removing penalties, starting January 1, 2019, for not complying with the ACA's individual mandate to carry health insurance and delaying the implementation of certain ACA-mandated fees including, without limitation, the medical device excise tax. On December 14, 2018, a Texas U.S. District Court Judge ruled that the ACA is unconstitutional in its entirety because the "individual mandate" was repealed by Congress as part of the Tax Cuts and Jobs Act. While the Texas U.S. District Court Judge, as well as the Trump administration and CMS, have stated that the ruling will have no immediate effect pending appeal of the decision, it is unclear how this decision, subsequent appeals, and other efforts to repeal and replace the ACA will impact the ACA and our business. Additional legislation may be enacted that further amends, or repeals, the ACA, which could result in lower numbers of insured individuals, reduced coverage for insured individuals and adversely affect our and our customers' business.

In addition, other legislative changes have been proposed and adopted since the Affordable Care Act was enacted. On August 2, 2011, the Budget Control Act of 2011 was signed into law, which, among other things, reduced Medicare payments to providers by 2% per fiscal year, effective on April 1, 2013 and, due to subsequent legislative amendments to the statute, will remain in effect through 2027 unless additional Congressional action is taken. On January 2, 2013, the American Taxpayer Relief Act of 2012 was signed into law, which, among other things, reduced Medicare payments to several providers, including hospitals, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years. The Medicare Access and CHIP Reauthorization Act of 2015, enacted on April 16, 2015 ("MACRA"), repealed the formula by which Medicare made annual payment adjustments to physicians and replaced the former formula with fixed annual updates and a new system of incentive payments scheduled to begin in 2019 that are based on various performance measures and physicians' participation in alternative payment models such as accountable care organizations.

In April 2014, Congress passed the Protecting Access to Medicare Act of 2014 ("PAMA"), which included substantial changes to the way in which clinical laboratory services are paid under Medicare. Under PAMA, laboratories that receive the majority of their Medicare revenue from payments made under the Medicare Clinical Laboratory Fee Schedule, or the Physician Fee Schedule are required to report to CMS, beginning in 2017 and every three years thereafter (or annually for "advanced diagnostic laboratory tests"), private payer payment rates and volumes for their tests. CMS will use this data to calculate a weighted median payment rate for each test, which will be used to establish revised Medicare reimbursement rates for the tests. Laboratories that fail to report the required payment information may be subject to substantial civil monetary penalties. It is unclear what impact new quality and payment programs, such as MACRA, or new pricing structures, such as those adopted under PAMA, may have on our business, financial condition, results of operations, or cash flows.

We anticipate there will continue to be proposals by legislators at both the federal and state levels, regulators and private payers to reduce costs while expanding individual healthcare benefits. Certain of these changes could impose additional limitations on the prices we will be able to charge for our tests, the coverage of or the amounts of reimbursement available for our tests from payers, including commercial payers and government payers.

If we use hazardous materials in a manner that causes injury, we could be liable for resulting damages.

Our activities currently require the use of hazardous chemicals and biological material. We cannot eliminate the risk of an accidental environmental release or injury to employees or third parties from the use, storage, handling, or disposal of these materials. In the event of an environmental release or injury, we could be held liable for any resulting damages, and any liability could exceed our resources or any applicable insurance coverage we may have. Additionally, we are subject on an ongoing basis to federal, state and local laws and regulations governing the use, storage, handling and disposal of these materials and specified waste products. The cost of maintaining compliance with these laws and regulations may become significant, and our failure to comply may result in substantial fines or other consequences, and either could negatively affect our operating results.

Risks Related to Our Intellectual Property

Litigation or other proceedings or third-party claims of intellectual property infringement, misappropriation or other violations may require us to spend significant time and money, and could in the future prevent us from selling our tests or impact our stock price, any of which could have a material adverse effect.

Our commercial success will depend in part on our avoiding infringement of patents and infringement, misappropriation or other violations of other proprietary rights of third parties, including for example the intellectual property of competitors. There is extensive intellectual property litigation involving the

biotechnology and pharmaceutical industries and genetic sequencing technology. Our activities may be subject to claims that we infringe or otherwise violate patents owned or controlled by third parties. Numerous U.S. and foreign patents and pending patent applications exist in the genetic testing market and are owned by third parties. We cannot assure you that our operations do not, or will not in the future, infringe existing or future patents. For example, we are aware of several third-party issued U.S. patents and pending patent applications with claims relating to genetic sequencing technology and methodology that may be asserted against us and may be construed to encompass our products and services, including ACE ImmunoID and ImmunoID NeXT technology. In order to avoid infringing these third-party patents, we may find it necessary to or prudent to initiate invalidity proceedings against such patents or to obtain licenses from such third-party intellectual property holders. If we are not able to invalidate such patents or obtain or maintain a license on commercially reasonable terms and such third parties assert infringement claims against us, we may be prevented from exploiting our technology and our business, financial condition, results of operations, and prospects may be materially and adversely affected. We may also be unaware of patents that a third party, including for example a competitor in the genetic testing market, might assert are infringed by our business. There may also be patent applications that, if issued as patents, could be asserted against us. Patent applications in the United States and elsewhere are typically published approximately 18 months after the earliest filing for which priority is claimed, with such earliest filing date being commonly referred to as the priority date. Certain U.S. patent applications that will not be filed outside the United States can remain confidential until patents issue. Therefore, patent applications covering our products, services, or technologies could have been filed by third parties without our knowledge. Additionally, pending patent applications that have been published can, subject to certain limitations, be later amended in a manner that could cover our products, services, technologies, and their use. The scope of a patent claim is determined by an interpretation of the law, the written disclosure in a patent and the patent's prosecution history and can involve other factors such as expert opinion. Our interpretation of the relevance or the scope of claims in a patent or a pending application may be incorrect, which may negatively impact our ability to market our products and services. Further, we may incorrectly determine that our technologies, products, or services are not covered by a third-party patent or may incorrectly predict whether a third party's pending patent application will issue with claims of relevant scope. Our determination of the expiration date of any patent in the United States or abroad that we consider relevant may be incorrect, which may negatively impact our ability to develop and market our products or services.

Third-party intellectual property right holders may also actively bring infringement or other intellectual property-related claims against us, even if we have received patent protection for our technologies, products, and services. Regardless of the merit of third parties claims against us for infringement, misappropriation or violations of their intellectual property rights, such third parties may seek and obtain injunctive or other equitable relief, which could effectively block our ability to perform our tests. Further, if a patent infringement suit were brought against us, we could be forced to stop or delay our development or sales of any tests or other activities that are the subject of such suit. Defense of these claims, even if such claims are resolved in our favor, could cause us to incur substantial expenses and be a substantial diversion of our employee resources even if we are ultimately successful. Any adverse ruling or perception of an adverse ruling in defending ourselves could have a material adverse impact on our cash position and stock price. Such litigation or proceedings could substantially increase our operating losses and reduce the resources available for development activities or any future sales, marketing, or distribution activities. We may not have sufficient financial or other resources to conduct such litigation or proceedings adequately. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources and more mature and developed intellectual property portfolios.

As we continue to commercialize our tests in their current or an updated form, launch different and expanded tests and enter new markets, other competitors might claim that our tests infringe, misappropriate or violate their intellectual property rights as part of business strategies designed to impede our successful commercialization and entry into new markets. If such a suit were brought, regardless of merit, there is no assurance that a court would find in our favor on questions of infringement, validity, enforceability or priority. Even if we are successful in defending against such suit, we could incur substantial costs and diversion of the

attention of our management and technical personnel in defending ourselves against such claims. A court of competent jurisdiction could hold that third-party patents asserted against us are valid, enforceable, and infringed, which could materially and adversely affect our ability to commercialize any products, services or technologies we may develop and any other technologies covered by the asserted third-party patents and any adverse ruling or perception of an adverse ruling in defending ourselves could have a material adverse impact on our cash position and stock price. If we are found to infringe, misappropriate or otherwise violate a third party's intellectual property rights, and we are unsuccessful in demonstrating that such rights are invalid or unenforceable, we may be required to pay substantial damages, including treble damages and attorneys' fees for willful infringement; obtain one or more licenses from third parties in order to continue developing and marketing our products and technology, which may not be available on commercially reasonable terms (if at all) or may be non-exclusive, thereby giving our competitors and other third parties access to the same technologies licensed to us; pay substantial royalties and other fees; and redesign any infringing tests or other activities, which may be impossible or require substantial time and monetary expenditure, or be prohibited from commercializing certain tests, all of which could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Where we collaborate with third parties in the development of technology, our collaborators may not properly maintain or defend our intellectual property rights or may use our proprietary information in such a way as to invite litigation that could jeopardize or invalidate our intellectual property or proprietary information. Further, collaborators may infringe the intellectual property rights of third parties, which may expose us to litigation and potential liability. Also, we may be obligated under our agreements with our collaborators, licensors, suppliers and others to indemnify and hold them harmless for damages arising from intellectual property infringement by us.

If we cannot license rights to use technologies on reasonable terms, we may not be able to commercialize new products in the future.

In the future, we may identify additional third-party intellectual property we may need to license in order to engage in our business, including to develop or commercialize new products or services. However, such licenses may not be available on acceptable terms or at all. Even if such licenses are available, we may be required to pay the licensor substantial royalties based on sales of our products and services. Such royalties are a component of the cost of our products or services and may affect the margins on our products and services. In addition, such licenses may be nonexclusive, which could give our competitors access to the same intellectual property licensed to us. If we are unable to enter into the necessary licenses on acceptable terms or at all, if any necessary licenses are subsequently terminated, if our licensors fail to abide by the terms of the licenses, if our licensors fail to prevent infringement by third parties, or if the licensed patents or other rights are found to be invalid or unenforceable, our business, financial condition, results of operations, and prospects could be materially and adversely affected.

If licenses to third-party intellectual property rights are or become required for us to engage in our business, the rights may be non-exclusive, which could give our competitors access to the same technology or intellectual property rights licensed to us. Moreover, we could encounter delays in the introduction of tests while we attempt to develop alternatives. Defense of any lawsuit or failure to obtain any of these licenses on favorable terms could prevent us from commercializing tests, which could materially affect our ability to grow and thus adversely affect our business and financial condition.

Developments or uncertainty in the patent statute, patent case law or U.S. Patent and Trademark Office ("USPTO"), rules and regulations may impact the validity, scope or enforceability of our patent rights, thereby impairing our ability to protect our products.

Our patent rights, their associated costs, and the enforcement or defense of such patent rights may be affected by developments or uncertainty in the patent statute, patent case law or USPTO rules and regulations.

There are a number of recent changes to the patent laws that may have a significant impact on our ability to protect our technology and enforce our intellectual property rights. For example, the Leahy-Smith America Invents Act (the "AIA") enacted within the last several years involves significant changes in patent legislation. These include provisions that affect the way patent applications will be prosecuted and may also affect patent litigation. As an example, assuming that other requirements for patentability are met, prior to March 2013, in the United States, 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 AIA, the United States transitioned to a first inventor to file system in which, assuming that other requirements for patentability are met, means that the party that is first to file in the United States generally is awarded the patent rights, regardless of whether such party invented the claimed invention first.

The AIA 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 United States 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. The AIA and its implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents, all of which could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Further, the standards applied by the USPTO and foreign patent offices in granting patents are not always applied uniformly or predictably. For example, there is no uniform worldwide policy regarding patentable subject matter or the scope of claims allowable in biotechnology patents. As such, we do not know the degree of future protection that we will have on our technologies, products, and services. While we will endeavor to try to protect our technologies, products, and services with intellectual property rights such as patents, as appropriate, the process of obtaining patents is time-consuming, expensive, and sometimes unpredictable.

In addition, the patent position of companies engaged in the development and commercialization of diagnostic tests is particularly uncertain. Various courts, including the Supreme Court have rendered decisions that affect the scope of patentability of certain inventions or discoveries relating to certain diagnostic tests and related methods. 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 genetic variants and cancer) are not themselves patentable. Precisely what constitutes a law of nature or abstract idea is uncertain, and it is possible that certain aspects of genetic diagnostics tests would be considered natural laws. Accordingly, the evolving case law in the United States may adversely affect our ability to obtain patents 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 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 cost and divert our efforts and attention from other aspects of our business.

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

Patents have a limited lifespan. In the United States, the natural expiration of a patent is generally 20 years after its first effective non-provisional filing date. Although various extensions may be available, the life of a

patent, and the protection it affords, is limited. Even if patents covering our technologies, products, and services are obtained, once the patent life has expired, we may be open to competition from competitive products. Our issued patents will expire on dates ranging from 2033 to 2035, subject to any patent extensions that may be available for such patents. If patents are issued on our pending patent applications, the resulting patents are projected to expire on dates ranging from 2033 to 2038. In addition, although upon issuance in the United States a patent's life can be increased based on certain delays caused by the USPTO, this increase can be reduced or eliminated based on certain delays caused by the patent applicant during patent prosecution. If we do not have sufficient patent life to protect our technologies, products and services, our competitive position, business, financial condition, results of operations, and prospects will be adversely affected.

If we are not able to obtain and enforce patent protection for any products we develop and for our technologies, or if the scope of patent protection obtained is not sufficiently broad, our competitors and other third parties could develop and commercialize products and technology similar or identical to ours, and our ability to successfully commercialize our products, services, and technologies may be adversely affected.

We have applied, and we intend to continue applying, for patents covering such aspects of our technologies as we deem appropriate. However, the patent process is expensive, time consuming and complex, and we may not be able to apply for patents on certain aspects of our services, products, and other technologies in a timely fashion, at a reasonable cost, in all jurisdictions or at all, and any potential patent coverage we obtain may not be sufficient to prevent substantial competition.

Moreover, the patent position of biotechnology companies can be highly uncertain because it involves complex legal and factual questions for which important legal principles remain unresolved. No consistent policy regarding the breadth of claims allowed 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 for analyzing nucleic acid sequences.

Others may independently develop similar or alternative technologies or design around technologies for which we may not be able to obtain patent protection. In addition, any patent applications we file may be challenged and may not result in issued patents or may be invalidated, rendered unenforceable or narrowed in scope after they are issued, and there is no guarantee any of our issued patents include or will include claims that are sufficiently broad to cover our products, services and other technologies or to provide meaningful protection from our competitors. Consequently, we do not know whether any of our platform advances, products, services and other technologies will be protectable or remain protected by valid and enforceable patents. Our competitors or other third parties may be able to circumvent our patents by developing similar or alternative technologies or products in a non-infringing manner.

Even if they are unchallenged, our patents and patent applications may not adequately protect our intellectual property, provide exclusivity for our technologies, products, and services, or prevent others from designing around our claims. Any finding that our patents or applications are invalid, unpatentable or unenforceable could harm our ability to prevent others from practicing the related technology, and a finding that others have inventorship or ownership rights to our patents and applications could require us to obtain certain rights to practice related technologies, which may not be available on favorable terms, if at all. If we initiate lawsuits to protect or enforce our patents, or litigate against third-party claims, which would be expensive, and, if we lose, we may lose some of our intellectual property rights. Furthermore, these lawsuits may divert the attention of our management and technical personnel. Any of the foregoing could have a material adverse effect on our competitive position, business, financial condition, results of operations, and prospects

Once granted, patents may remain open to opposition, interference, re-examination, post-grant review, *inter partes* review, nullification or derivation action in court or before patent offices or similar proceedings for a

given period after allowance or grant, during which time third parties can raise objections against such initial grant. In the course of such proceedings, which may continue for a protracted period of time, the patent owner may be compelled to limit the scope of the granted claims thus attacked, or may lose the granted claims altogether. An adverse determination in any such proceeding or litigation could reduce the scope of, or invalidate, our patent rights, allow third parties to commercialize our technology or products and compete directly with us, without payment to us, or result in our inability to commercialize our products, services and technologies without infringing third-party patent rights. Such proceedings also may result in substantial cost and require significant time from our scientists and management, even if the eventual outcome is favorable to us. 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 technologies. In addition, there can be no assurance that:

- others will not or may not be able to make, use, offer to sell, or sell tests that are the same as or similar to our products or services but that are not covered by the claims of the patents that we own or license;
- we or our future licensors or collaborators are the first to make the inventions covered by each of our issued patents and pending patent applications that we own or license;
- we or our future licensors or collaborators are the first to file patent applications covering certain aspects of our inventions;
- others will not independently develop similar or alternative technologies or duplicate any of our technologies without infringing our intellectual property rights;
- a third party may not challenge our patents and, if challenged, a court would hold that our patents are valid, enforceable, and infringed;
- any issued patents that we own or may license will provide us with any competitive advantages, or will not be challenged by third parties;
- we may develop or in-license additional proprietary technologies that are patentable;
- pending patent applications that we own or may license will lead to issued patents;
- the patents of others will not have a material or adverse effect on our business, financial condition, results of operations, and prospects; and
- our competitors do not conduct research and development activities in countries where we do not have enforceable patent rights and then use the information learned from such activities to develop competitive products for sale in our major commercial markets.

The issuance of a patent is not conclusive as to its inventorship, scope, validity, or enforceability. Some of our patents or patent applications may be challenged at a future point in time in opposition, derivation, reexamination, *inter partes* review, post-grant review, or interference proceedings. Any successful opposition to these patents or any other patents owned by or, if applicable in the future, licensed to us could deprive us of rights necessary for the practice of our technologies or the successful commercialization of any products or technologies that we may develop, which could lead to increased competition to our business and harm our business. Since patent applications in the United States and most other countries are confidential for a period of time after filing, we cannot be certain that we or our licensors were the first to file any patent application related to our technologies, products, or services. Furthermore, an interference proceeding can be provoked by a third party or instituted by the USPTO to determine who was the first to invent any of the subject matter covered by the patent claims of our applications for any application with an effective filing date before March 16, 2013.

Where we obtain licenses from or collaborate with third parties, in some circumstances, we may not have the right to control the preparation, filing, and prosecution of patent applications, or to maintain the patents, covering technology that we license from third parties. We may also require the cooperation of our licensors and collaborators to enforce any licensed patent rights, and such cooperation may not be provided. Therefore, these

patents and applications may not be prosecuted and enforced in a manner consistent with the best interests of our business. Moreover, if we do obtain necessary licenses, we will likely have obligations under those licenses, and any failure to satisfy those obligations could give our licensor the right to terminate the license. Termination of a necessary license could have a material adverse impact on our business.

It is also possible that we fail to file patent applications covering inventions made in the course of development and commercialization activities before a competitor or another third party files a patent application covering, or publishes information disclosing, a similar, independently-developed invention. Such competitor's patent application may pose obstacles to our ability to obtain or limit the scope of patent protection we may obtain. Although we enter into non-disclosure and confidentiality agreements with parties who have access to confidential or patentable aspects of our research and development output, such as our employees, collaborators, contract manufacturers, consultants, advisors, and other third parties, any of these parties may breach the agreements and disclose such output before a patent application is filed, thereby jeopardizing our ability to seek patent protection. In addition, 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 18 months after filing, or in some cases not at all. Therefore, we cannot be certain that we or our licensors were the first to make the inventions claimed in our owned or licensed patents or pending patent applications, or were the first to file for patent protection of such inventions. To determine the priority of these inventions, we may have to participate in interference proceedings, derivation proceedings, *inter partes* review proceedings, or other post-grant proceedings declared by the USPTO that could result in substantial cost to us. The outcome of such proceedings is uncertain. No assurance can be given that other patent applications will not have priority over our patent applications. In addition, changes to the patent laws of the United States allow for various post-grant opposition proceedings, such as *inter partes* review proceedings, that have not been extensively tested, and their outcome is therefore uncertain. An unfavorable outcome could require us to cease using the related technology or to attempt to license rights to it from the prevailing party. Our business could be harmed if the prevailing party does not offer us a license on commercially reasonable terms or at all, or if a non-exclusive license is offered and our competitors gain access to the same technology. Furthermore, if third parties bring these proceedings against our patents, we could experience significant costs and management distraction.

We may become involved in lawsuits to protect or enforce our patents or other intellectual property, which could be expensive, time consuming, and unsuccessful.

Competitors may also infringe our patents or the patents of our licensing partners. In addition, our patents or the patents of our licensors may become involved in inventorship, priority, or validity disputes. To counter or defend against such claims can be expensive and time consuming. In an infringement proceeding, a court may refuse to stop the other party from using the technology at issue on the grounds that our owned and in-licensed patents do not cover the technology in question. Further in such proceedings, the defendant could counterclaim that our asserted patent covering our product is invalid or unenforceable, and the court may agree that our asserted patent is invalid or unenforceable. In patent litigation in the United States, defendant 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 lack of novelty, obviousness or non-enablement. Grounds for an unenforceability assertion could be an allegation that someone connected with the prosecution of the patent withheld relevant information from the USPTO, or made a misleading statement, during prosecution. Third parties may also raise similar claims before administrative bodies in the United States or abroad, even outside the context of litigation. Such mechanisms include re-examination, post grant review, *inter partes* review, and equivalent proceedings in foreign jurisdictions (e.g., opposition proceedings). Such proceedings could result in revocation or amendment to our patents in such a way that they no longer cover our product. 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. An adverse result in any litigation or other proceeding could put one or more of our owned or in-licensed patents at risk of being invalidated or interpreted narrowly. Such a loss of patent protection could have a material adverse impact on our business. 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.

Even if resolved in our favor, litigation or other legal proceedings relating to intellectual property claims may cause us to incur significant expenses and could distract our personnel from their normal responsibilities. In addition, there could be public announcements of the results of hearings, motions, or other interim proceedings or developments, and 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. Such litigation or proceedings could substantially increase our operating losses and reduce the resources available for development activities or any future sales, marketing, or distribution activities. We may not have sufficient financial or other resources to conduct such litigation or proceedings adequately. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources and more mature and developed intellectual property portfolios. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could have a material adverse effect on our ability to compete in the marketplace.

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

We seek protection for certain aspects of our technologies, products and services through the filing of patents, registration of copyrights and use of non-disclosure agreements. In addition, we also expect to rely on trade secrets and proprietary know-how protection for our confidential and proprietary information, and we have taken security measures to protect this information. These measures, however, may not provide adequate protection for our trade secrets, know-how, or other confidential information. Among other things, we seek to protect our trade secrets, know-how, and confidential information by entering into confidentiality agreements with parties who have access to them, such as our employees, collaborators, contract manufacturers, consultants, advisors, and other third parties. We cannot guarantee that we have entered into such agreements with each party that may have or have had access to our trade secrets or proprietary technology and processes. Moreover, there can be no assurance that any confidentiality agreements that we have with our employees, consultants, or other third parties will provide meaningful protection for our trade secrets, know-how, and confidential information or will provide adequate remedies in the event of unauthorized use or disclosure of such information. Despite these efforts, 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. Monitoring unauthorized uses and disclosures is difficult, and we do not know whether the steps we have taken to protect our proprietary technologies will be effective. Accordingly, there also can be no assurance that our trade secrets or know-how will not otherwise become known or be independently developed by competitors.

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 would be materially and adversely harmed.

Trade secrets and know-how can be difficult to protect as trade secrets and know-how will over time be disseminated within the industry through independent development, the publication of journal articles, and the movement of personnel skilled in the art from company to company or academic to industry scientific positions. If any of our trade secrets were to be lawfully obtained or independently developed by a competitor or other third party, we would have no right to prevent such competitor from using that technology or information to compete with us, which could harm our competitive position. Because from time to time we expect to rely on third parties in the development, manufacture and distribution of our products and provision of our services, we must, at times, share trade secrets with them. We seek to protect our proprietary technology in part by entering into confidentiality agreements and, if applicable, material transfer agreements, license agreements, collaboration

agreements, supply agreements, consulting agreements or other similar agreements with our advisors, employees, collaborators, licensors, suppliers, third-party contractors, and consultants prior to beginning research or disclosing proprietary information. These agreements typically limit the rights of the third parties to use or disclose our confidential information, including our trade secrets and know-how. Despite the contractual provisions employed when working with third parties, the need to share trade secrets, know-how, and other confidential information increases the risk that such trade secrets and know-how become known by our competitors, are inadvertently incorporated into the technology of others, or are disclosed or used in violation of these agreements. Given that our proprietary position is based, in part, on our know-how and trade secrets, a competitor's discovery of our trade secrets or know-how, or other unauthorized use or disclosure would impair our competitive position and may have an adverse effect on our business and results of operations.

In addition, these agreements typically restrict the ability of our advisors, employees, collaborators, licensors, suppliers, third-party contractors, and consultants to publish data potentially relating to our trade secrets or know-how, although our agreements may contain certain limited publication rights. Despite our efforts to protect our trade secrets and know-how, our competitors may discover our trade secrets or know-how, either through breach of our agreements with third parties, independent development, or publication of information by any of our third-party collaborators. A competitor's discovery of our trade secrets or know-how would impair our competitive position and have a material adverse impact on our business.

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

Filing, prosecuting, maintaining, defending, and enforcing patents on our products, services, and technologies in all countries throughout the world would be prohibitively expensive, and our intellectual property rights in some countries outside the United States can be less extensive than those in the United States. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop their own products and, further, may export otherwise infringing products to territories where we have patent protection or licenses 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. In addition, the laws of some foreign countries do not protect proprietary rights to the same extent as the laws of the United States, and many companies have encountered significant challenges in establishing and enforcing their proprietary rights outside of the United States. These challenges can be caused by the absence or inconsistency of the application of rules and methods for the establishment and enforcement of intellectual property rights outside of the United States. In addition, the legal systems of some countries, particularly developing countries, do not favor the enforcement of patents and other intellectual property protection, especially those relating to healthcare. This could make it difficult for us to stop the infringement of our patents, if obtained, or the misappropriation of our other intellectual property rights. For example, many foreign countries, including European Union countries, India, Japan, and China, have compulsory licensing laws under which a patent owner may be compelled under specified circumstances to grant licenses to third parties. In addition, many countries limit the enforceability of patents against third parties, including government agencies or government contractors. In these countries, patents may provide limited or no benefit given that we may have limited remedies available if patents are infringed or if we are compelled to grant a license to a third party, which could materially diminish the value of those patents and limit our potential revenue opportunities. Furthermore, patent protection must ultimately be sought on a country-by-country basis, which is an expensive and time-consuming process with uncertain outcomes. Accordingly, we may choose not to seek patent protection in certain countries, and we will not have the benefit of patent protection 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. Accordingly, our efforts to protect our intellectual property rights in such countries may be inadequate. In addition, changes in the law and legal decisions by courts in the United States and foreign countries may affect our ability to obtain adequate protection for our products, services and other technologies and the enforcement of intellectual property. Any of the foregoing could have a material adverse effect on our competitive position, business, financial condition, results of operations, and prospects.

Obtaining and maintaining patent protection depends on compliance with various procedural, document submission, fee payment and other requirements imposed by governmental patent agencies, and our patent protection could be reduced or eliminated for non-compliance with these requirements.

The USPTO and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other provisions during the patent application and prosecution process. Periodic maintenance fees, renewal fees, annuity fees, and various other governmental fees on patents and/or applications will be due to be paid to the USPTO and various other governmental patent agencies outside of the United States in several stages over the lifetime of the patents and/or applications. We employ reputable professionals and rely on such third parties to help us comply with these requirements and effect payment of these fees with respect to the patents and patent applications that we own. Noncompliance events that could result in abandonment or lapse of a patent or patent application include failure to respond to official communications within prescribed time limits, non-payment of fees and failure to properly legalize and submit formal documents. In many cases, an inadvertent lapse can be cured by payment of a late fee or by other means in accordance with the applicable rules. However, there are situations in which noncompliance can result in abandonment or lapse of a patent or patent application, resulting in loss of patent rights in the relevant jurisdiction. In such an event, competitors might be able to enter the market earlier than would otherwise have been the case, which could have a material adverse effect on our competitive position, business, financial condition, results of operations, and prospects.

Third parties may assert that our employees or consultants have wrongfully used or disclosed confidential information or misappropriated trade secrets.

We employ individuals who were previously employed or otherwise engaged with universities or genetic testing, diagnostic or other healthcare companies, including our competitors or potential competitors.

Although we have policies to ensure that our employees and consultants do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that we or our employees or consultants have inadvertently or otherwise used or disclosed intellectual property, including trade secrets or other proprietary information, of a former employer or other third parties. Further, we may be subject to ownership disputes in the future arising, for example, from conflicting obligations of consultants or others who are involved in developing our intellectual property. Litigation may be necessary to defend against these claims. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. 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. Such claims could have a material adverse effect on our business, financial condition, results of operations, and prospects.

In addition, while it is our policy to require our employees and contractors who may be involved in the conception or development of intellectual property to execute agreements assigning such intellectual property to us, we may be unsuccessful in executing such an agreement with each party who, in fact, conceives or develops intellectual property that we regard as our own. The assignment of intellectual property rights may not be self-executing, or the assignment agreements may be breached, and we may be forced to bring claims against third parties, or defend claims that they may bring against us, to determine the ownership of what we regard as our intellectual property. Such claims could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Our use of "open source" software could subject our proprietary software to general release, adversely affect our ability to sell our products and services, and subject us to possible litigation.

A portion of the products or technologies licensed, developed, and/or distributed by us incorporate so-called "open source" software and we may incorporate open source software into other products in the future. Such open source software is generally licensed by its authors or other third parties under open source licenses. Some

open source licenses contain requirements that we disclose source code for modifications we make to the open source software and that we license such modifications to third parties at no cost. In some circumstances, distribution of our software in connection with open source software could require that we disclose and license some or all of our proprietary code in that software, as well as distribute our products or provide our services that use particular open source software at no cost to the user. We monitor our use of open source software in an effort to avoid uses in a manner that would require us to disclose or grant licenses under our proprietary source code; however, there can be no assurance that such efforts will be successful. Open source license terms are often ambiguous and such use could inadvertently occur. There is little legal precedent governing the interpretation of many of the terms of these licenses, and the potential impact of these terms on our business may result in unanticipated obligations regarding our products and technologies. Companies that incorporate open source software into their products have, in the past, faced claims seeking enforcement of open source license provisions and claims asserting ownership of open source software incorporated into their product. If an author or other third party that distributes such open source software were to allege that we had not complied with the conditions of an open source license, we could incur significant legal costs defending ourselves against such allegations. In the event such claims were successful, we could be subject to significant damages or be enjoined from the distribution of our products. In addition, if we combine our proprietary software with open source software in certain ways, under some open source licenses, we could be required to release the source code of our proprietary software, which could substantially help our competitors develop products that are similar to or better than ours and otherwise adversely affect our business. These risks could be difficult to eliminate or manage, and, if not addressed, could have a material adverse effect on our business, financial condition, and results of operations.

If we fail to comply with our obligations under license or technology agreements with third parties, we may be required to pay damages and we could lose license rights that are critical to our business.

We license certain intellectual property that is important to our business, and in the future we may enter into additional agreements that provide us with licenses to valuable intellectual property or technology. For example, our agreements with third parties, such as Illumina, include certain non-exclusive license rights that are essential to the operation of our business as it is currently conducted. If we fail to comply with any of the obligations under our license agreements, we may be required to pay damages and the licensor may have the right to terminate the license. Termination by the licensor would cause us to lose valuable rights, and could prevent us from selling our products and services, or inhibit our ability to commercialize future products and services. Our business would suffer if any current or future licenses terminate, if the licensors fail to abide by the terms of the license, if the licensors fail to enforce licensed patents against infringing third parties, if the licensed patents or other rights are found to be invalid or unenforceable, or if we are unable to enter into necessary licenses on acceptable terms. In addition, our rights to certain technologies, including those of Illumina, are licensed to us on a non-exclusive basis. The owners of these non-exclusively licensed technologies are therefore free to license them to third parties, including our competitors, on terms that may be superior to those offered to us, which could place us at a competitive disadvantage. Moreover, our licensors may own or control intellectual property that has not been licensed to us and, as a result, we may be subject to claims, regardless of their merit, that we are infringing or otherwise violating the licensor's rights.

Any collaboration arrangements that we may enter into in the future may not be successful, which could adversely affect our ability to develop and commercialize our products.

Any future collaborations that we enter into may not be successful. The success of our collaboration arrangements will depend heavily on the efforts and activities of our collaborators. Collaborations are subject to numerous risks, which may include that:

- collaborators have significant discretion in determining the efforts and resources that they will apply to collaborations;
- collaborators may not pursue development and commercialization of our products or may elect not to continue or renew development or commercialization programs based on trial or test results, changes in

their strategic focus due to the acquisition of competitive products, availability of funding, or other external factors, such as a business combination that diverts resources or creates competing priorities;

- collaborators could independently develop, or develop with third parties, products that compete directly or indirectly with our products;
- collaborators with marketing, manufacturing, and distribution rights to one or more products may not commit sufficient resources to or otherwise not perform satisfactorily in carrying out these activities;
- we could grant exclusive rights to our collaborators that would prevent us from collaborating with others;
- collaborators may not properly maintain or defend our intellectual property rights or may use our intellectual property or proprietary information in a way that gives rise to actual or threatened litigation that could jeopardize or invalidate our intellectual property or proprietary information or expose us to potential liability;
- disputes may arise between us and a collaborator that causes the delay or termination of the research, development, or commercialization of our current or future products or that results in costly litigation or arbitration that diverts management attention and resources;
- collaborations may be terminated, and, if terminated, may result in a need for additional capital to pursue further development or commercialization of the applicable current or future products;
- collaborators may own or co-own intellectual property covering our products that results from our collaborating with them, and in such cases, we would not have the exclusive right to develop or commercialize such intellectual property; and
- collaborators' sales and marketing activities or other operations may not be in compliance with applicable laws resulting in civil or criminal proceedings.

If we are unable to successfully obtain rights to required third-party intellectual property rights or maintain the existing intellectual property rights we have, we may have to abandon development of that program and our business and financial condition could suffer.

We may be subject to claims challenging the inventorship 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 patents, trade secrets, or other intellectual property as an inventor or co-inventor. For example, we or our licensors may have inventorship disputes arise from conflicting obligations of employees, consultants, or others who are involved in developing our products, services, or technologies. Litigation may be necessary to defend against these and other claims challenging inventorship or our licensors' ownership of our owned or in-licensed patents, trade secrets, or other intellectual property. If we 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 products, services, or technologies. 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 our trademarks and trade names are not adequately protected, then we may not be able to build name recognition in our markets of interest and our business may be adversely affected.

Our trademarks or trade names may be challenged, infringed, circumvented, or declared generic or determined to be infringing on other marks. We may not be able to protect our rights to these trademarks and trade names or may be forced to stop using these names, which we need for name recognition by potential partners or customers in our markets of interest. During trademark registration proceedings, we may receive

rejections. Although we would be given an opportunity to respond to those rejections, we may be unable to overcome such rejections. In addition, in the USPTO and in comparable agencies in many foreign jurisdictions, third parties are given an opportunity to oppose pending trademark applications and to seek to cancel registered trademarks. Opposition or cancellation proceedings may be filed against our trademarks, and our trademarks may not survive such proceedings. If we are unable to establish brand name recognition based on our trademarks and trade names, we may not be able to compete effectively and our business may be adversely affected.

Risks Related to Being a Public Company

The requirements of being a public company may strain our resources, result in litigation and divert management's attention.

As a public company, we will be subject to the reporting requirements of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), the Sarbanes-Oxley Act of 2002, as amended (the "Sarbanes-Oxley Act"), the Dodd-Frank Wall Street Reform and Consumer Protection Act, the listing requirements of the stock exchange on which we will list, and other applicable securities rules and regulations. Complying with these rules and regulations has increased and will increase our legal and financial compliance costs, make some activities more difficult, time-consuming, or costly and increase demand on our systems and resources, particularly after we are no longer an "emerging growth company" as defined in the Jumpstart our Business Startups Act of 2012 (the "JOBS Act"). The Exchange Act requires, among other things, that we file annual, quarterly, and current reports with respect to our business and operating results. The Sarbanes-Oxley Act requires, among other things, that we maintain effective disclosure controls and procedures and internal control over financial reporting. We are required to disclose changes made in our internal control and procedures on a quarterly basis. In order to maintain and, if required, improve our disclosure controls and procedures and internal control over financial reporting to meet this standard, significant resources and management oversight may be required. As a result, management's attention may be diverted from other business concerns, which could adversely affect our business and operating results. We will need to hire additional employees or engage outside consultants to comply with these requirements, which will increase our costs and expenses.

In addition, changing laws, regulations, and standards relating to corporate governance and public disclosure are creating uncertainty for public companies, increasing legal and financial compliance costs and making some activities more time-consuming. These laws, regulations, and standards are subject to varying interpretations, in many cases due to their lack of specificity, and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. This could result in continuing uncertainty regarding compliance matters and higher costs necessitated by ongoing revisions to disclosure and governance practices. We intend to invest resources to comply with evolving laws, regulations, and standards, and this investment will result in increased general and administrative expenses and a diversion of management's time and attention from revenue-generating activities to compliance activities. If our efforts to comply with new laws, regulations and standards differ from the activities intended by regulatory or governing bodies due to ambiguities related to their application and practice, regulatory authorities may initiate legal proceedings against us and our business may be adversely affected. By disclosing information in this prospectus and in filings required of a public company, our business and financial condition will become more visible, which we believe may result in threatened or actual litigation, including by competitors and other third parties. If those claims are successful, our business could be seriously harmed. Even if the claims do not result in litigation or are resolved in our favor, the time and resources needed to resolve them could divert our management's resources and seriously harm our business.

We also expect that being a public company and these new rules and regulations will make it more expensive for us to obtain director and officer liability insurance and, in the future, we may be required to accept reduced coverage or incur substantially higher costs to obtain coverage. These factors could also make it more difficult for us to attract and retain qualified members of our board of directors, particularly to serve on our audit committee and compensation committee, and qualified executive officers.

In addition, as a result of our disclosure obligations as a public company, we will have reduced strategic flexibility and will be under pressure to focus on short-term results, which may materially and adversely affect our ability to achieve long-term profitability.

We are an emerging growth company, and any decision on our part to comply only with certain reduced reporting and disclosure requirements applicable to emerging growth companies could make our common stock less attractive to investors.

We are an "emerging growth company," as defined in the JOBS Act, and, for as long as we continue to be an emerging growth company, we may choose to take advantage of exemptions from various reporting requirements applicable to other public companies but not to emerging growth companies, including:

- not being required to have our independent registered public accounting firm audit our internal control over financial reporting under Section 404 of the Sarbanes-Oxley Act;
- reduced disclosure obligations regarding executive compensation in our periodic reports and annual report on Form 10-K; and
- exemptions from the requirements of holding non-binding advisory votes on executive compensation and stockholder approval of any golden parachute payments not previously approved.

We could be an emerging growth company for up to five years following the closing of this offering. Our status as an emerging growth company will end as soon as any of the following takes place:

- the last day of the fiscal year in which we have more than $1.07 billion in annual revenue;
- the date we qualify as a "large accelerated filer," with at least $700 million of equity securities held by non-affiliates;
- the date on which we have issued, in any three-year period, more than $1.0 billion in non-convertible debt securities; or
- the last day of the fiscal year ending after the fifth anniversary of the closing of this offering.

We cannot predict if investors will find our common stock less attractive if we choose to rely on any of the exemptions afforded emerging growth companies. If some investors find our common stock less attractive because we rely on any of these exemptions, there may be a less active trading market for our common stock and the market price of our common stock may be more volatile.

Under the JOBS Act, emerging growth companies can also delay adopting new or revised accounting standards until such time as those standards apply to private companies. We have irrevocably elected not to avail ourselves of this accommodation and, therefore, we will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

Material weaknesses in our internal control over financial reporting may cause us to fail to timely and accurately report our financial results or result in a material misstatement of our financial statements.

Management evaluates our internal control systems, processes, and procedures for compliance with the requirements of a smaller reporting company under Section 404 of the Sarbanes-Oxley Act of 2002 ("Section 404"). This evaluation includes disclosure of any material weaknesses identified by our management in our internal control over financial reporting. A "material weakness" is a deficiency, or a combination of deficiencies, in internal control over financial reporting such that there is a reasonable possibility that a material misstatement of our annual or interim financial statements will not be prevented or detected on a timely basis.

In connection with preparation of our financial statements for the years ended December 31, 2017 and 2018, management identified a material weakness in our internal controls due to a lack of sufficient full-time

accounting staff with requisite experience and deep technical accounting knowledge to (i) identify and resolve complex accounting issues under generally accepted accounting principles in the United States ("GAAP") and (ii) allow for appropriate segregation of duties. The identified material weakness could result in misstatements to our consolidated financial statements that would be material and would not be prevented or detected on a timely basis.

We are evaluating and implementing additional procedures to remediate this material weakness, however, we cannot assure you that these or other measures will fully remediate the material weakness in a timely manner or prevent future material weaknesses from occurring. As part of our remediation plan to address the material weakness identified above, we hired a new Chief Financial Officer in March 2019 and are actively working to hire additional accounting employees with the specific technical accounting and financial reporting experience necessary for a public company. We will continue to assess the adequacy of our accounting personnel and resources, and will add additional personnel, as well as adjust our resources, as necessary, commensurate with any increase in the size and complexity of our business.

If we identify future material weaknesses in our internal controls over financial reporting or fail to meet the demands that will be placed upon us as a public company, including the requirements of the Sarbanes-Oxley Act, we may be unable to accurately report our financial results or report them within the timeframes required by law or stock exchange regulations. Failure to comply with Section 404 could also potentially subject us to sanctions or investigations by the U.S. Securities and Exchange Commission (the "SEC") or other regulatory authorities. If additional material weaknesses exist or are discovered in the future, and we are unable to remediate any such material weakness, our reputation, financial condition, and operating results could suffer.

Our disclosure controls and procedures may not prevent or detect all errors or acts of fraud.

Upon closing of this offering, we will have implemented disclosure controls and procedures designed to provide reasonable assurance that information we must disclose in reports we file or submit under the Exchange Act is accumulated and communicated to management and recorded, processed, summarized, and reported within the time periods specified in the rules and forms of the SEC. However, any disclosure controls and procedures, no matter how well-conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met.

These inherent limitations include the realities that judgments in decision-making can be faulty and that breakdowns can occur because of simple errors or mistakes. Additionally, controls can be circumvented by the individual acts of some persons, by collusion of two or more people or by an unauthorized override of the controls. As a result, because of these inherent limitations in our control system, misstatements or omissions due to error or fraud may occur and may not be detected, which could result in failures to file required reports in a timely manner and filing reports containing incorrect information. Any of these outcomes could result in SEC enforcement actions, monetary fines or other penalties, damage to our reputation, and harm to our financial condition.

Risks Related to This Offering and Our Common Stock

An active trading market for our common stock may never develop or be sustained.

Prior to this offering, there has been no public market for our common stock. We have applied to list our common stock on The Nasdaq Global Market under the symbol "PSNL." However, we cannot assure you that an active trading market for our common stock will develop on that exchange or elsewhere or, if developed, that any market will be sustained. Accordingly, we cannot assure you of the likelihood that an active trading market for our common stock will develop or be maintained, the liquidity of any trading market, your ability to sell your shares of our common stock when desired, or the prices that you may obtain for your shares. Further, an inactive market may also impair our ability to raise capital by selling our common stock and may impair our ability to

enter into strategic partnerships or acquire businesses, products, or technologies using our common stock as consideration.

The market price of our common stock may be volatile or may decline steeply or suddenly regardless of our operating performance and we may not be able to meet investor or analyst expectations. You may not be able to resell your shares at or above the initial public offering price and may lose all or part of your investment.

The initial public offering price for our common stock will be determined through negotiations between the underwriters and us, and may vary from the market price of our common stock following this offering. If you purchase shares of our common stock in this offering, you may not be able to resell those shares at or above the initial public offering price. We cannot assure you that the market price following this offering will equal or exceed prices in privately negotiated transactions of our shares that have occurred from time to time before this offering. The market price of our common stock may fluctuate or decline significantly in response to numerous factors, many of which are beyond our control, including:

- actual or anticipated fluctuations in our operating results;
- failure to meet or exceed financial estimates and projections of the investment community or that we provide to the public;
- issuance of new or updated research reports by securities analysts or changed recommendations for our stock;
- competition from existing tests or new tests that may emerge;
- announcements by us or our competitors of significant acquisitions, strategic partnerships, joint ventures, collaborations, capital commitments, or by or pertaining to our customers, particularly the VA MVP;
- the timing and amount of our investments in the growth of our business;
- actual or anticipated changes in regulatory oversight of our business or issues we may face with regulators;
- additions or departures of key management or other personnel;
- inability to obtain additional funding;
- sales of our common stock by us or our stockholders in the future;
- disputes or other developments related to our intellectual property or other matters, including litigation; and
- general economic, industry, and market conditions, including factors unrelated to our operating performance or the operating performance of our competitors.

In addition, the stock market in general, and the market for life sciences companies in particular, has experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of those companies. Broad market and industry factors may seriously affect the market price of our common stock, regardless of our actual operating performance. These fluctuations may be even more pronounced in the trading market for our stock shortly following this offering. In addition, in the past, following periods of volatility in the overall market and the market price of a particular company's securities, securities class action litigation has often been instituted against these companies. This litigation, if instituted against us, could result in substantial costs and a diversion of our management's attention and resources.

Moreover, because of these fluctuations, comparing our operating results on a period-to-period basis may not be meaningful. You should not rely on our past results as an indication of our future performance. This

variability and unpredictability could also result in our failing to meet the expectations of industry or financial analysts or investors for any period. If our revenues or operating results fall below the expectations of analysts or investors or below any forecasts we may provide to the market, or if the forecasts we provide to the market are below the expectations of analysts or investors, the price of our common stock could decline substantially. Such a stock price decline could occur even when we have met any previously publicly stated revenues or earnings forecasts that we may provide.

Our quarterly results may fluctuate significantly, which could adversely impact the value of our common stock.

Our quarterly results of operations, including our revenue, gross margin, profitability, and cash flows, may vary significantly in the future, and period-to-period comparisons of our operating results may not be meaningful. Accordingly, our quarterly results should not be relied upon as an indication of future performance. Our quarterly financial results may fluctuate as a result of a variety of factors, many of which are outside of our control. For example, the VA and other large customers are not obliged to deliver tissue samples to us at any particular time or at all. The rate at which we receive tissue samples can vary dramatically from quarter to quarter, and is difficult or impossible for us to accurately forecast. Our receipt and processing of tissue samples from our customers leads to our recognition of revenue, and as such the variable rates of delivery of customer samples will lead to variations in our revenues from quarter to quarter. Fluctuations in quarterly results may adversely impact the value of our common stock. Factors that may cause fluctuations in our quarterly financial results include, without limitation, those listed elsewhere in this “Risk Factors” section. We also may face competitive pricing pressures, and we may not be able to maintain our pricing in the future, which would adversely affect our operating results.

Insiders may exercise significant control over our company and will be able to influence corporate matters.

Our directors, executive officers, and 5% or greater stockholders and their affiliates beneficially owned, in the aggregate, approximately 76.0% of our outstanding capital stock as of March 31, 2019. Upon the closing of this offering, this same group will hold approximately 59.3% of our outstanding capital stock, without giving effect to any purchases that certain of these holders may make through our directed share program. As a result, these stockholders will be able to exercise significant influence over all matters submitted to our stockholders for approval, including the election of directors and approval of significant corporate transactions, such as a merger or sale of our company or its assets. This concentration of ownership may have the effect of delaying or preventing a third party from acquiring control of our company and could adversely affect the market price of our common stock, and may not be in the best interests of our other stockholders.

Future sales of shares by existing stockholders, or the perception that such sales could occur, could cause our stock price to decline.

If our existing stockholders sell, or indicate an intent to sell, substantial amounts of our common stock in the public market after the 180-day contractual lock-up and other legal restrictions on resale discussed in this prospectus lapse, the trading price of our common stock could decline significantly and could decline below the initial public offering price. Based on 21,829,701 shares outstanding as of March 31, 2019 (and assuming the exercise in full of a warrant exercisable for 188,643 shares of common stock), upon the closing of this offering, we will have 28,496,368 outstanding shares of common stock. Of these shares, the 6,666,667 shares of common stock sold in this offering, plus any shares sold pursuant to the underwriters’ option to purchase additional shares, will be immediately freely tradable, without restriction, in the public market, unless they are purchased in this offering by our affiliates, as that term is defined in Rule 144 under the Securities Act of 1933, as amended (the “Securities Act”) or if they are purchased in our directed share program. Morgan Stanley & Co. LLC, BofA Securities, Inc., and Cowen and Company, LLC, however, may, in their discretion, permit our officers, directors, and other stockholders who have entered to lock-up agreements in connection with this offering to sell shares prior to the expiration of the lock-up agreements.

After the lock-up agreements pertaining to this offering expire, substantially all of such shares will be eligible for sale in the public market. In addition, upon issuance, the 4,381,884 shares of common stock subject to outstanding options under our stock option plans as March 31, 2019 will become eligible for sale in the public market in the future, subject to certain legal and contractual limitations. Moreover, 180 days after the closing of this offering, holders of up to an aggregate of 18,790,983 shares of our common stock (including an aggregate of 127,598 shares issuable upon the exercise of warrants that were outstanding as of March 31, 2019) will have the right to require us to register these shares under the Securities Act pursuant to an investors' rights agreement. If our existing stockholders sell substantial amounts of our common stock in the public market, or if the public perceives that such sales could occur, this could have an adverse effect on the market price of our common stock.

We also intend to register shares of our common stock that we may issue under our equity incentive plans, totaling 4,745,324 shares subject to outstanding options and 7,440,524 additional shares reserved for issuance as of the closing of this offering. Once we register these shares, they will be freely tradable in the public market upon issuance, subject to volume and manner of sale limitations applicable to affiliates and other legal and contractual limitations.

We have broad discretion in how we may use the net proceeds from this offering, and we may not use them effectively.

We cannot specify with any certainty the particular uses of the net proceeds that we will receive from this offering. Our management will have broad discretion in applying the net proceeds we receive from this offering for any of the purposes described in section titled "Use of Proceeds." You will not have the opportunity, as part of your investment decision, to assess whether we are using the net proceeds appropriately, and you will be relying on the judgment of our management regarding the use of these net proceeds. Our management may not apply the net proceeds in ways that increase the value of your investment. If our management fails to use these funds effectively, our business could be seriously harmed. Pending their use, the net proceeds from this offering may be invested in a way that does not produce income or that loses value.

We do not currently intend to pay dividends on our common stock and, consequently, your ability to achieve a return on your investment will depend on appreciation of the value of our common stock.

We have never declared or paid cash dividends on our capital stock. We currently intend to retain any future earnings to finance the operation and expansion of our business, and we do not expect to pay any cash dividends on our common stock in the foreseeable future. In addition, our ability to pay cash dividends on our capital stock is limited by our credit agreement and may be prohibited or limited by the terms of any future debt financing arrangement. As a result, any investment returns on our common stock will depend upon increases in the value for our common stock, which are not certain.

Our ability to use net operating losses to offset future taxable income may be subject to limitations.

As of December 31, 2018, we had federal and state net operating loss carryforwards of approximately $87 million and approximately $48.6 million, respectively. Certain of our federal and state net operating loss carryforwards will begin to expire, if not utilized, beginning in 2031. These net operating loss carryforwards could expire unused and be unavailable to offset future income tax liabilities. Under the Tax Cuts and Jobs Act, 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. It is uncertain if and to what extent various states will conform to the Tax Cuts and Jobs Act. In addition, under Section 382 of the Code, and corresponding provisions of state law, if a corporation undergoes an "ownership change," which is generally defined as a greater than 50% change, by value, in its equity ownership over a three-year period, the corporation's ability to use its pre-change net operating loss carryforwards and other pre-change tax attributes (including certain tax credits) to offset its post-change income or taxes may be limited. It is possible that we have experienced an ownership change or that we will experience one in connection with this offering. We may experience ownership changes in the future as a

result of subsequent shifts in our stock ownership, some of which may be outside of our control. If an ownership change occurs and our ability to use our net operating loss carryforwards is materially limited, it would harm our future operating results by effectively increasing our future tax obligations.

Purchasers in this offering will experience immediate and substantial dilution in the book value of their investment.

The initial public offering price of our common stock is substantially higher than the net tangible book value per share of our common stock as of March 31, 2019. Therefore, if you purchase our common stock in this offering, you will incur immediate dilution of $12.56 per share, based on an assumed initial public offering price of $15.00 per share, which is the midpoint of the price range on the cover page of this prospectus. This dilution is due to the substantially lower price paid by our investors who purchased shares prior to this offering as compared to the price offered to the public in this offering, and any previous exercise of stock options granted to our service providers. In addition, as of March 31, 2019, options to purchase 4,381,884 shares of our common stock with a weighted-average exercise price of approximately $3.62 per share were outstanding. The exercise of any of these options would result in additional dilution. As a result of the dilution to investors purchasing shares in this offering, investors may receive less than the purchase price paid in this offering, if anything, in the event of our liquidation. In addition, new investors who purchase shares in this offering will contribute approximately 52.4% of the total amount of equity capital raised by us through the date of this offering, but will only own approximately 23.4% of the outstanding equity capital. For a detailed description of the dilution that you will experience immediately after this offering, see the section titled “Dilution.”

Future sales and issuances of our common stock or rights to purchase common stock, including pursuant to our equity incentive plans, could result in additional dilution of the percentage ownership of our stockholders and could cause the stock price of our common stock to decline.

We may issue additional securities following the closing of this offering. In the future, we may sell common stock, convertible securities, or other equity securities in one or more transactions at prices and in a manner we determine from time to time. We also expect to issue common stock to employees, directors, and consultants pursuant to our equity incentive plans. If we sell common stock, convertible securities, or other equity securities in subsequent transactions, or common stock is issued pursuant to equity incentive plans, investors may be materially diluted. New investors in such subsequent transactions could gain rights, preferences, and privileges senior to those of holders of our common stock, including the holders of shares of our common stock sold in this offering.

If securities or industry analysts do not publish research or reports about our business, or publish inaccurate or unfavorable research about our business, our stock price and trading volume could decline.

The trading market for our common stock will depend in part on the research and reports that equity research analysts publish about us and our business. We do not control these analysts or the content and opinions included in their reports. Securities analysts may elect not to provide research coverage of our company after the closing of this offering, and such lack of research coverage may adversely affect the market price of our common stock. The price of our common stock could also decline if one or more equity research analysts downgrade our common stock or issue other unfavorable commentary or cease publishing reports about us or our business. If one or more equity research analysts cease coverage of our company, we could lose visibility in the market, which in turn could cause our stock price to decline.

Holders of our common stock could be adversely affected if we issue preferred stock.

Pursuant to our amended and restated certificate of incorporation, our board of directors is authorized to issue up to 10,000,000 shares of preferred stock without any action on the part of our stockholders. Our board of directors will also have the power, without stockholder approval, to set the terms of any series of preferred stock

that may be issued, including voting rights, dividend rights, preferences over our common stock with respect to dividends or in the event of a dissolution, liquidation, or winding up, and other terms. In the event that we issue preferred stock in the future that has preferences over our common stock with respect to payment of dividends or upon our liquidation, dissolution, or winding up, or if we issue preferred stock that is convertible into our common stock at greater than a one-to-one ratio, the voting and other rights of the holders of our common stock or the market price of our common stock could be adversely affected.

Delaware law and provisions in our amended and restated certificate of incorporation and amended and restated bylaws that will be in effect on the closing of this offering could make a merger, tender offer, or proxy contest difficult, thereby depressing the trading price of our common stock.

Our amended and restated certificate of incorporation and amended and restated bylaws that will be in effect on the closing of this offering contain provisions that could depress the trading price of our common stock by acting to discourage, delay or prevent a change of control of our company or changes in our management that the stockholders of our company may deem advantageous. These provisions include the following:

- establish a classified board of directors so that not all members of our board of directors are elected at one time;
- authorize the issuance of "blank check" preferred stock that our board of directors could use to implement a stockholder rights plan;
- permit the board of directors to establish the number of directors and fill any vacancies and newly-created directorships;
- provide that directors may only be removed for cause;
- require super-majority voting to amend some provisions in our certificate of incorporation and bylaws;
- eliminate the ability of our stockholders to call special meetings of stockholders;
- prohibit stockholder action by written consent, which requires all stockholder actions to be taken at a meeting of our stockholders;
- provide that the board of directors is expressly authorized to make, alter, or repeal our bylaws;
- restrict the forum for certain litigation against us to Delaware; and
- establish advance notice requirements for nominations for election to our board of directors or for proposing matters that can be acted upon by stockholders at annual stockholder meetings.

Any provision of our amended and restated certificate of incorporation or amended and restated bylaws, each of which will be in effect on the closing of this offering or Delaware law that has the effect of delaying or deterring a change in control could limit the opportunity for our stockholders 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. For information regarding these and other provisions, see the section titled "Description of Capital Stock—Anti-Takeover Effects of Delaware Law and Our Certificate of Incorporation and Bylaws."

Our amended and restated certificate of incorporation that will be in effect on the closing of this offering will provide that the Court of Chancery of the State of Delaware and the federal district courts of the United States will be the exclusive forums for substantially all disputes between us and our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers, or employees.

Our amended and restated certificate of incorporation that will be in effect on the closing of this offering will provide that the Court of Chancery of the State of Delaware is the exclusive forum for the following types of actions or proceedings under Delaware statutory or common law:

- any derivative action or proceeding brought on our behalf;

- any action asserting a breach of fiduciary duty;
- any action asserting a claim against us arising under the Delaware General Corporation Law, our amended and restated certificate of incorporation, or our amended and restated bylaws; and
- any action asserting a claim against us governed by the internal affairs doctrine.

This provision would not apply to suits brought to enforce a duty or liability created by the Exchange Act or any other claim for which the U.S. federal courts have exclusive jurisdiction.

Our amended and restated certificate of incorporation that will be in effect on the closing of this offering will further provide that the federal district courts of the United States will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act, subject to and contingent upon a final adjudication in the State of Delaware of the enforceability of such exclusive forum provision.

These exclusive-forum provisions may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable 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 either exclusive-forum provision in our amended and restated certificate of incorporation that will be in effect on the closing of this offering to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving the dispute in other jurisdictions, which could seriously harm our business. 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. However, this decision may be reviewed and ultimately overturned by the Delaware Supreme Court.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus contains forward-looking statements about us and our industry that involve substantial risks and uncertainties. All statements other than statements of historical facts contained in this prospectus, including statements regarding our future results of operations, financial condition, business strategy and plans, and objectives of management for future operations, including our statements regarding the benefits and timing of the roll-out of new technology, are forward-looking statements. In some cases, you can identify forward-looking statements because they contain words such as “anticipate,” “believe,” “contemplate,” “continue,” “could,” “estimate,” “expect,” “intend,” “may,” “plan,” “potential,” “predict,” “project,” “should,” “target,” “will,” or “would,” or the negative of these words or other similar terms or expressions. Forward-looking statements in this prospectus include, but are not limited to, statements about:

- the evolution of cancer therapies and market adoption of our services;
- estimates of our total addressable market, future revenue, expenses, capital requirements, and our needs for additional financing;
- our ability to compete effectively with existing competitors and new market entrants;
- our ability to scale our infrastructure;
- our ability to manage and grow our business by expanding our sales to existing customers or introducing our products to new customers;
- expectations regarding our relationship with the VA MVP;
- our ability to establish and maintain intellectual property protection for our products or avoid claims of infringement;
- potential effects of extensive government regulation;
- our ability to hire and retain key personnel;
- our ability to obtain additional financing in this or future offerings;
- the volatility of the trading price of our common stock;
- our belief that FDA approval of personalized cancer therapies may drive benefits to our business;
- our expectation regarding the time during which we will be an emerging growth company under the JOBS Act; and
- our expectations regarding uses of proceeds from this offering.

You should not rely on forward-looking statements as predictions of future events. We have based the forward-looking statements contained in this prospectus primarily on our current expectations and projections about future events and trends that we believe may affect our business, financial condition, and operating results. The outcome of the events described in these forward-looking statements is subject to risks, uncertainties, and other factors described in the section titled “Risk Factors” and elsewhere in this prospectus. Moreover, we operate in a very competitive and rapidly changing environment. New risks and uncertainties emerge from time to time, and it is not possible for us to predict all risks and uncertainties that could have an impact on the forward-looking statements contained in this prospectus. The results, events, and circumstances reflected in the forward-looking statements may not be achieved or occur, and actual results, events, or circumstances could differ materially from those described in the forward-looking statements.

In addition, statements that “we believe” and similar statements reflect our beliefs and opinions on the relevant subject. These statements are based on information available to us as of the date of this prospectus. While we believe that information provides a reasonable basis for these statements, that information may be limited or incomplete. Our statements should not be read to indicate that we have conducted an exhaustive inquiry into, or review of, all relevant information. These statements are inherently uncertain, and investors are cautioned not to unduly rely on these statements.

The forward-looking statements made in this prospectus relate only to events as of the date on which the statements are made. We undertake no obligation to update any forward-looking statements made in this prospectus to reflect events or circumstances after the date of this prospectus or to reflect new information or the occurrence of unanticipated events, except as required by law. We may not actually achieve the plans, intentions, or expectations disclosed in our forward-looking statements, and you should not place undue reliance on our forward-looking statements. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, joint ventures, or investments.

MARKET, INDUSTRY, AND OTHER DATA

This prospectus contains estimates and information concerning our industry and our business, including estimated market size, projected growth rates of the markets in which we participate, and the prevalence of certain medical conditions. Unless otherwise expressly stated, we obtained this industry, business, market, medical, and other information from reports, research surveys, studies, and similar data prepared by third parties, industry, medical, and general publications, government data, and similar sources.

This information involves a number of assumptions and limitations, and you are cautioned not to give undue weight to these estimates. We have not independently verified any third-party information and cannot assure you of its accuracy or completeness. Although we are responsible for all of the disclosure contained in this prospectus and we believe the market position, market opportunity, market size, and medical information included in this prospectus is reliable, such information is inherently imprecise. In addition, projections, assumptions, and estimates of our future performance and the future performance of the industry in which we operate are necessarily subject to a high degree of uncertainty and risk due to a variety of factors, including those described in the section titled “Risk Factors.” These and other factors could cause results to differ materially from those expressed in these publications and reports.

Certain information in the text of this prospectus is contained in independent industry publications. The source of these independent industry publications is provided below:

- U.S. National Library of Medicine, *ClinicalTrials.gov*, January 2019.
- Public Health Faculty Publications, *SEER Cancer Statistics Review*, 1975-2015.
- American Cancer Society, *Cancer Facts and Figures 2019*, 2019.
- American Cancer Society, *Cancer Facts and Figures 2018*, 2018.
- BIO Industry Analysis, *Clinical Development Success Rates 2006-2015*, June 2016.
- European Journal of Cancer, *Cancer incidence and mortality patterns in Europe: Estimates for 40 countries and 25 major cancers in 2018*, August, 9 2018.
- World Health Organization, Latest global cancer data: *Cancer burden rises to 18.1 million new cases and 9.6 million cancer deaths in 2018*, September 12, 2018.
- World Health Organization, *World’s health ministers renew commitment to cancer prevention and control*, 2017.

We use multiple sources and assumptions to estimate the total addressable market for tissue and liquid biopsy testing in clinical trials for immunotherapy, targeted cancer therapy, and personalized cancer therapy. Our estimates of the number of patients and clinical trials are based on data from the U.S. National Library of Medicine, *ClinicalTrials.gov*, January 2019. We assume that patients in such clinical trials will receive one tumor biopsy test and three liquid biopsy tests over the course of a clinical trial, and the cost of tumor and liquid biopsy tests will be $5,000 and $7,000 on average, respectively.

We also use multiple sources and assumptions to estimate the total addressable market for tissue and liquid biopsy testing in personalized cancer therapy. Our estimate of the number of cancer patients that are projected to be diagnosed with late-stage disease in 2019 is based on a combination of data derived from Public Health Faculty Publications, *SEER Cancer Statistics Review*, 1975-2015 (only data relating to cancer cases diagnosed—and the respective stage of disease upon diagnosis—from 2008 to 2014 was used for our purposes), American Cancer Society, *Cancer Facts and Figures 2018*, 2018, American Cancer Society, *Cancer Facts and Figures 2019*, 2019, and a review article from the European Journal of Cancer, *Cancer incidence and mortality patterns in Europe: Estimates for 40 countries and 25 major cancers in 2018*, August 9, 2018. We assume that personalized cancer therapy patients will receive one tumor biopsy test and three liquid biopsy tests over the course of a clinical trial or treatment, with the average cost per test being the same as is outlined above in the United States and $3,000 and $4,200 on average per test, respectively, in the European Union.

We also use multiple sources and assumptions to estimate the total addressable market for oncology clinical diagnostic testing for advanced cancer therapies. Our estimate of the number of cancer patients that are projected to be diagnosed in 2019 is based on a combination of data derived from the American Cancer Society, *Cancer Facts and Figures 2018*, 2018, American Cancer Society, *Cancer Facts and Figures 2019*, 2019, and a review article from the European Journal of Cancer, *Cancer incidence and mortality patterns in Europe: Estimates for 40 countries and 25 major cancers in 2018*, August 9, 2018. We assume that pre-diagnosis cancer patients will receive one oncology clinical diagnostic test to inform their treatment strategy or to identify clinical trial enrollment opportunities, and the cost per test will be $3,000 on average, which we believe is in line with current cancer panels.

Certain monetary amounts, percentages, and other figures included elsewhere in this prospectus have been subject to rounding adjustments. Accordingly, figures shown as totals in certain tables or charts may not be the arithmetic aggregation of the figures that precede them, and figures expressed as percentages in the text may not total 100% or, as applicable, when aggregated may not be the arithmetic aggregation of the percentages that precede them.

USE OF PROCEEDS

We estimate that we will receive net proceeds from this offering of approximately $89.8 million (or approximately $103.8 million if the underwriters exercise their over-allotment option in full) based on the assumed initial public offering price of $15.00 per share of common stock, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

A $1.00 increase (decrease) in the assumed initial public offering price of $15.00 per share of common stock would increase (decrease) the net proceeds to us from this offering by approximately $6.2 million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions. Similarly, each increase (decrease) of 1.0 million shares in the number of shares of common stock offered by us would increase (decrease) the net proceeds to us from this offering by approximately $14.0 million, assuming the assumed initial public offering price of $15.00 per share of common stock remains the same, and after deducting estimated underwriting discounts and commissions.

The principal purposes of this offering are to increase our capitalization and financial flexibility, and create a public market for our common stock. We currently intend to use the net proceeds we receive from this offering for expanded research and development, infrastructure expansion, facilities expansion, headcount growth, sales and marketing expenditures, public company costs, capital expenditures, and working capital. We cannot specify with certainty all of the particular uses for the remaining net proceeds to us from this offering. We may also use a portion of the net proceeds for acquisitions or strategic investments in complementary businesses, services, products, or technologies. However, we do not have agreements or commitments to enter into any such acquisitions or investments at this time. We will have broad discretion over how to use the net proceeds to us from this offering. We intend to invest the net proceeds we receive from this offering in a variety of capital-preservation investments, including short- and intermediate-term, interest-bearing, investment-grade securities and government securities.

DIVIDEND POLICY

We have never declared or paid cash dividends on our capital stock. We currently intend to retain all available funds and future earnings, if any, to fund the development and expansion of our business, and we do not anticipate paying any cash dividends in the foreseeable future. Any future determination regarding the declaration and payment of dividends will be at the discretion of our board of directors and will depend on then-existing conditions, including our financial condition, operating results, contractual restrictions, capital requirements, business prospects, and other factors our board of directors may deem relevant. In addition, we may enter into agreements in the future that could contain restrictions on payments of cash dividends.

CAPITALIZATION

The following table sets forth our cash and cash equivalents and our capitalization as of March 31, 2019 as follows:

- on an actual basis;
- on a pro forma basis, giving effect to (i) the automatic conversion of all outstanding shares of our redeemable convertible preferred stock as of March 31, 2019 into 18,474,742 shares of common stock immediately prior to the closing of this offering, (ii) the cash exercise of a warrant to purchase 188,643 shares of our common stock, outstanding as of March 31, 2019, in full, (iii) the automatic conversion of two warrants to purchase an aggregate of 84,585 shares of our redeemable convertible preferred stock, outstanding as of March 31, 2019, into warrants to purchase an equivalent number of shares of our common stock, and the related reclassification of redeemable convertible preferred stock warrant liability to stockholders' equity, (iv) stock-based compensation expense of $0.9 million associated with outstanding stock options subject to a performance condition for which the service-based vesting condition was satisfied as of March 31, 2019 and which we will recognize in connection with this offering, and (v) the filing and effectiveness of our amended and restated certificate of incorporation that will be in effect prior to the closing of this offering; and
- on a pro forma as adjusted basis, giving effect to (i) the pro forma adjustments set forth above and (ii) the issuance and sale of 6,666,667 shares of common stock in this offering at the assumed initial public offering price of $15.00 per share, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

The pro forma and 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 in conjunction with our consolidated financial statements and the related notes included in this prospectus and the "Management's Discussion and Analysis of Financial Condition and Results of Operations" section and other financial information contained in this prospectus.

	As of March 31, 2019		
	Actual	Pro Forma	Pro Forma as Adjusted(1)
	(unaudited) (in thousands, except share and per share data)		
Cash and cash equivalents	$ 33,237	$ 33,245	$ 123,045
Long-term debt	$ 18,941	$ 18,941	$ 18,941
Convertible preferred stock warrant liability	$ 817	$ —	$ —
Series A redeemable convertible preferred stock, $0.0001 par value—31,250,00 shares authorized, 7,812,497 shares issued and outstanding, actual; no shares authorized, issued, or outstanding, pro forma and pro forma as adjusted (unaudited)	20,261	—	—
Series B redeemable convertible preferred stock, $0.0001 par value—19,288,150 shares authorized, 4,799,548 shares issued and outstanding, actual; no shares authorized, issued, or outstanding, pro forma and pro forma as adjusted (unaudited)	22,047	—	—
Series C redeemable convertible preferred stock, $0.0001 par value—24,700,000 shares authorized, 5,862,697 shares issued and outstanding, actual; no shares authorized, issued, or outstanding, pro forma and pro forma as adjusted (unaudited)	47,096	—	—
Total redeemable convertible preferred stock	$ 90,221	$ —	$ —
Stockholders' deficit:			
Preferred stock, $0.0001 par value—no shares authorized, issued, or outstanding, actual; 10,000,000 shares authorized, no shares issued or outstanding, pro forma and pro forma as adjusted (unaudited)	—	—	—
Common stock, $0.0001 par value—105,700,000 shares authorized, 3,166,316 shares issued and outstanding, actual; 200,000,000 shares authorized, 21,829,701 shares issued and outstanding, pro forma (unaudited); 200,000,000 shares authorized, 28,496,368 shares issued and outstanding, pro forma as adjusted (unaudited)	1	2	3
Additional paid-in capital	10,666	101,784	191,583
Accumulated other comprehensive income	—	—	—
Accumulated deficit	(121,190)	(122,080)	(122,080)
Total stockholders' equity (deficit)	(110,523)	(20,294)	69,506
Total capitalization	$ (1,362)	$ (1,353)	$ 88,447

(1) Each $1.00 increase (decrease) in the assumed initial public offering price of $15.00 per share of common stock, would increase (decrease) the pro forma as adjusted amount of each of cash and cash equivalents, total stockholders' equity (deficit) and total capitalization by approximately $6.2 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 estimated underwriting discounts and commissions. Similarly, each increase (decrease) of 1.0 million shares in the number of shares offered by us at the assumed initial public offering price per share would increase (decrease) the pro forma as adjusted amount of each of cash and cash equivalents, total stockholders' equity (deficit) and total capitalization by approximately $14.0 million, assuming the assumed

initial public offering price of $15.00 per share of common stock remains the same, and after deducting estimated underwriting discounts and commissions. The pro forma and pro forma as adjusted information discussed above is illustrative only and will change based on the actual initial public offering price and other terms of this offering determined at pricing.

The outstanding share information in the table above is based on 21,829,701 shares of our common stock (including shares of our redeemable convertible preferred stock on an as-converted basis, and assuming the exercise of a warrant to purchase 188,643 shares of our common stock) outstanding as of March 31, 2019, and excludes:

- 4,381,884 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Plan and outstanding as of March 31, 2019, with a weighted-average exercise price of $3.62 per share;
- 363,440 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Plan after March 31, 2019, with an exercise price of $13.20 per share;
- 84,585 shares of our redeemable convertible preferred stock issuable upon the exercise of warrants to purchase shares of our redeemable convertible preferred stock outstanding as of March 31, 2019, with a weighted-average exercise price of $7.13 per share;
- 65,502 shares of our common stock issuable upon the exercise of a warrant to purchase shares of our common stock outstanding as of March 31, 2019, with an exercise price of $9.16 per share;
- 7,440,524 shares of our common stock reserved for future issuance under our 2019 Plan, (including up to 5,440,524 shares of our common stock comprised of (i) the shares reserved and remaining available for issuance under our 2011 Plan that will be added to our 2019 Plan reserve upon its effectiveness plus (ii) the number of shares subject to stock options or other stock awards granted under our 2011 Plan that would have otherwise returned to our 2011 Plan, which will be added as they become available (e.g., due to forfeiture of the underlying 2011 Plan award) which includes an annual evergreen increase and will become effective in connection with this offering; and
- 250,000 shares of our common stock reserved for future issuance under our ESPP, which includes an annual evergreen increase and will become effective in connection with this offering.

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 after this offering.

As of March 31, 2019, we had a pro forma net tangible book value (deficit) of $(20.3) million, or $(0.93) per share. Pro forma net tangible book value per share represents the amount of our total tangible assets less our total liabilities, divided by the number of shares of our common stock outstanding as of March 31, 2019, after giving effect to the automatic conversion of all shares of our redeemable convertible preferred stock outstanding as of March 31, 2019 into 18,474,742 shares of our common stock and assuming the exercise of a warrant to purchase 188,643 shares of our common stock.

After giving further effect to the sale of 6,666,667 shares of common stock that we are offering at the assumed initial public offering price of $15.00 per share, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us, our pro forma as adjusted net tangible book value as of March 31, 2019 would have been approximately $69.5 million, or approximately $2.44 per share. This amount represents an immediate increase in pro forma net tangible book value of $3.37 per share to our existing stockholders and an immediate dilution in pro forma net tangible book value of approximately $12.56 per share to new investors purchasing shares of common stock in this offering.

Dilution per share to new investors is determined by subtracting pro forma as adjusted net tangible book value per share after this offering from the initial public offering price per share paid by new investors. The following table illustrates this dilution (without giving effect to any exercise by the underwriters of their over-allotment option):

Assumed initial public offering price per share		$15.00
Pro forma net tangible book value (deficit) per share as of March 31, 2019	$(0.93)	
Increase in pro forma net tangible book value per share attributable to this offering	3.37	
Pro forma as adjusted net tangible book value per share after this offering		2.44
Dilution per share to new investors in this offering		$12.56

Each $1.00 increase (decrease) in the assumed initial public offering price of $15.00 per share would increase (decrease) the pro forma as adjusted net tangible book value per share after this offering by approximately $0.22, and dilution in pro forma net tangible book value per share to new investors by approximately $0.78, 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 estimated underwriting discounts and commissions. Each increase (decrease) of 1.0 million shares in the number of shares of common stock offered by us would increase (decrease) our pro forma as adjusted net tangible book value per share after this offering by approximately $0.39 per share and decrease (increase) the dilution to investors participating in this offering by approximately $0.39 per share, assuming that the assumed initial public offering price remains the same, and after deducting estimated underwriting discounts and commissions.

If the underwriters exercise their over-allotment option in full, the pro forma as adjusted net tangible book value after the offering would be $2.83 per share, the increase in pro forma net tangible book value per share to existing stockholders would be $3.76 per share and the dilution per share to new investors would be $12.17 per share, in each case assuming an initial public offering price of $15.00 per share.

The following table summarizes on the pro forma as adjusted basis described above, as of March 31, 2019, the differences between the number of shares of common stock purchased from us by our existing stockholders and common stock by new investors purchasing shares in this offering, the total consideration paid to us in cash

and the average price per share paid by existing stockholders for shares of common stock issued prior to this offering and the price to be paid by new investors for shares of common stock in this offering. The calculation below is based on the assumed initial public offering price of $15.00 per share, before deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

	Shares Purchased		Total Consideration		Average Price Per Share
	Number	Percent	Amount	Percent	
Existing stockholders	21,829,701	76.6%	$ 90,715,199	47.6%	$ 4.16
New investors	6,666,667	23.4	100,000,005	52.4	$15.00
Total	28,496,368	100%	$190,715,204	100%	

The outstanding share information in the table above is based on 21,829,701 shares of our common stock (including shares of our redeemable convertible preferred stock on an as-converted basis, and assuming the exercise of a warrant to purchase 188,643 shares of our common stock) outstanding as of March 31, 2019, and excludes:

- 4,381,884 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Plan and outstanding as of March 31, 2019, with a weighted-average exercise price of $3.62 per share;
- 363,440 shares of our common stock issuable upon the exercise of options to purchase shares of our common stock granted under our 2011 Plan after March 31, 2019, with an exercise price of $13.20 per share;
- 84,585 shares of our redeemable convertible preferred stock issuable upon the exercise of warrants to purchase shares of our redeemable convertible preferred stock outstanding as of March 31, 2019, with a weighted-average exercise price of $7.13 per share;
- 65,502 shares of our common stock issuable upon the exercise of a warrant to purchase shares of our common stock outstanding as of March 31, 2019, with an exercise price of $9.16 per share;
- 7,440,524 shares of our common stock reserved for future issuance under our 2019 Plan, (including up to 5,440,524 shares of our common stock comprised of (i) the shares reserved and remaining available for issuance under our 2011 Plan that will be added to our 2019 Plan reserve upon its effectiveness plus (ii) the number of shares subject to stock options or other stock awards granted) which includes an annual evergreen increase and will become effective in connection with this offering; and
- 250,000 shares of our common stock reserved for future issuance under our ESPP, which includes an annual evergreen increase and will become effective in connection with this offering.

To the extent any outstanding options are exercised, there will be further dilution to new investors. If all of such outstanding options had been exercised as of March 31, 2019, the pro forma as adjusted net tangible book value per share after this offering would be $2.60, and total dilution per share to new investors would be $12.40.

If the underwriters exercise their over-allotment option in full, our existing stockholders would own 74.0% and the investors purchasing shares of our common stock in this offering would own 26.0% of the total number of shares of our common stock outstanding immediately after closing of this offering.

SELECTED CONSOLIDATED FINANCIAL DATA

We derived the selected consolidated statements of operations data and consolidated balance sheets data for the fiscal years ended December 31, 2017 and 2018 from our audited consolidated financial statements included elsewhere in this prospectus. The summary consolidated statements of operations and comprehensive loss data for the three months ended March 31, 2018 and 2019 and the summary consolidated balance sheet data as of March 31, 2019 are derived from our unaudited interim condensed consolidated financial statements included elsewhere in this prospectus. We have prepared the unaudited interim condensed consolidated financial statements on the same basis as the audited financial statements and have included, in our opinion, all adjustments, consisting only of normal recurring adjustments that we consider necessary for a fair statement of the financial information set forth in those statements. The summary financial data included in this section are not intended to replace the financial statements and related notes included elsewhere in this prospectus. You should read the selected consolidated financial data set forth below in conjunction with our consolidated financial statements, the notes to our consolidated financial statements and "Management's Discussion and Analysis of Financial Condition and Results of Operations" contained elsewhere in this prospectus. Our historical results are not necessarily indicative of our future performance, and our interim results for the three months ended March 31, 2019 are not necessarily indicative of results to be expected for the full year ending December 31, 2019, or any other period.

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
	(in thousands, except share and per share data)			
Revenues	$ 9,393	$ 37,774	$ 4,164	$ 14,075
Costs and expenses				
Costs of revenues[1]	11,736	25,969	4,065	10,091
Research and development[1]	9,919	14,304	2,949	5,245
Selling, general, and administrative[1]	9,901	11,271	2,313	4,170
Total costs and expenses	31,556	51,544	9,327	19,506
Loss from operations	(22,163)	(13,770)	(5,163)	(5,431)
Interest income	100	293	61	84
Interest expense	(1,303)	(1,894)	(622)	(184)
Loss on debt extinguishment	—	(4,658)	—	—
Other (expense) income, net	(227)	150	351	(152)
Loss before income taxes	(23,593)	(19,879)	(5,373)	(5,683)
Provision for income taxes	(5)	(7)	(2)	(2)
Net loss	$ (23,598)	$ (19,886)	$ (5,375)	$ (5,685)
Net loss per share, basic and diluted[2]	$ (7.78)	$ (6.49)	$ (1.76)	$ (1.84)
Weighted-average shares outstanding, basic and diluted[2]	3,031,636	3,063,157	3,051,581	3,091,342
Pro forma net loss per share, basic and diluted (unaudited)[2]		$ (0.95)		$ (0.26)
Pro forma weighted-average shares outstanding, basic and diluted (unaudited)[2]		20,483,543		21,754,727

(1) Includes stock-based compensation as follows:

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
	(in thousands)			
Costs of revenues	$ 74	$ 177	$ 24	$ 85
Research and development	225	429	64	164
Selling, general, and administrative	454	711	81	360
Total stock-based compensation expense	$ 753	$ 1,317	$ 169	$ 609

(2) See the consolidated statements of operations and Note 15 to our consolidated financial statements included elsewhere in this prospectus for an explanation of the method used to compute the historical and pro forma net loss per share and the number of shares used in the computation of the per share amounts.

	As of December 31,		As of March 31,	
	2017	2018	2018	2019
			(unaudited)	
	(in thousands)			
Consolidated Balance Sheet Data:				
Cash and cash equivalents	$ 22,617	$ 19,744	$ 21,844	$ 33,237
Working capital(1)	(22,262)	(28,291)	(29,162)	(15,348)
Total assets	33,563	41,670	35,302	57,647
Redeemable convertible preferred stock warrant liability	292	683	292	817
Additional paid-in capital	3,025	9,131	3,220	10,666
Accumulated deficit	(95,619)	(115,505)	(100,995)	(121,190)
Total stockholders' deficit	(92,603)	(106,388)	(97,780)	(110,523)

(1) Working capital is defined as total current assets less total current liabilities. See our consolidated financial statements and the related notes included elsewhere in this prospectus for further details regarding our current assets and current liabilities.

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

The following Management's Discussion and Analysis of Financial Condition and Results of Operations should be read together with our consolidated financial statements and accompanying notes included elsewhere within this prospectus. This discussion includes both historical information and forward-looking information that involves risk, uncertainties, and assumptions. Our actual results may differ materially from management's expectations as a result of various factors, including, but not limited to, those discussed in the section titled "Risk Factors."

Overview

We are a growing cancer genomics company transforming the development of next-generation therapies by providing more comprehensive molecular data about each patient's cancer and immune response. We designed our NeXT Platform to adapt to the complex and evolving understanding of cancer, providing our biopharmaceutical customers with information on all of the approximately 20,000 human genes, together with the immune system, in contrast to many cancer panels that cover roughly 50 to 500 genes. We are also developing a complementary liquid biopsy assay that analyzes all human genes versus the more narrowly focused liquid biopsy assays that are currently available. By combining technological innovation, operational scale, and regulatory differentiation, our NeXT Platform is designed to help our customers obtain new insights into the mechanisms of response and resistance to therapy as well as new potential therapeutic targets. Our platform enhances the ability of biopharmaceutical companies to unlock the potential of conducting translational research in the clinic rather than with pre-clinical animal models or cancer cell lines. We are also planning to release a diagnostic based on our NeXT Platform that we envision being used initially by biopharmaceutical customers and clinical collaborators. Since inception, we have provided our services to more than 45 biopharmaceutical customers, including several of the largest pharmaceutical companies in the world.

We have focused on human genome sequencing since our inception in 2011. In 2013, we introduced our patented ACE Exome technology, providing enhanced and more complete coverage over all of the approximately 20,000 human genes. The superior performance of ACE Exome technology compared to other exomes was described in Genome Medicine and Nature Review publications.

In November 2016, we launched our ACE ImmunoID product, the first generation of our immuno-oncology genomics platform that combined our ACE exome and transcriptome technology with analytics to provide a more comprehensive tumor profiling solution for biopharma customers conducting cancer clinical trials and translational research. With ACE ImmunoID for Personalized Cancer Therapy, we further enhanced the platform for personalized cancer therapy customers with additional neoantigen analytics, improved turnaround times, and access to a Device Master File that we filed with the U.S. Food and Drug Administration. With the ACE ImmunoID for Biomarkers, we extended the platform further with ImmunogenomicsID, a broad immuno-genomics biomarker analysis engine. In November 2018, we announced ImmunoID NeXT, our universal cancer immunogenomics platform, which is the first technology to enable comprehensive analysis of both a tumor and its immune microenvironment from a single sample and provides utility across immuno-oncology, targeted, and personalized therapies. We expect to do a full commercial launch of ImmunoID NeXT in 2019.

In parallel with the work described above, we also developed multiple clinical diagnostic tests. Clinical diagnostic testing has remained a small portion of our business, primarily because we have elected not to expend the time and resources necessary to secure third-party reimbursement, choosing instead to pursue more immediate revenue opportunities. Nevertheless, it has helped us to develop important capabilities that do not depend on third-party reimbursement. In June 2015, we launched our ACE CancerPlus Test based on a 1,400-gene panel. We plan to build on this experience in 2019 by introducing a clinical diagnostic test based on our ImmunoID NeXT Platform, which will include all of the approximately 20,000 human genes and will be targeted initially to biopharmaceutical customers.

In parallel with the development of our platform technology, we have also provided DNA sequencing and analysis services under contract with the U.S. Department of Veterans Affairs (the "VA") Million Veteran Program (the "VA MVP"), beginning in 2012. This relationship with the VA MVP has enabled us to innovate, scale our operational infrastructure, and achieve greater efficiencies in our lab.

Our customers include large-cap pharmaceutical companies, emerging biotechnology companies, universities, non-profit medical research institutes, and government entities. We generated revenues of $9.4 million and $37.8 million for the years ended December 31, 2017 and 2018, respectively, and $4.2 million and $14.1 million for the three months ended March 31, 2018 and 2019, respectively. In 2018, 49% of our revenues were generated from VA MVP. Non-VA MVP revenues increased by 114% in 2018 compared to 2017. For the three months ended March 31, 2019, 59% of our revenues were generated from VA MVP. Non-VA MVP revenues increased by 162% in the three months ended March 31, 2019 compared to the three months ended March 31, 2018. Our top five customers represented 45% and 82% of revenues in 2017 and 2018, respectively, and 76% and 90% of revenues for the three months ended March 31, 2018 and 2019, respectively.

We also incurred net losses of $23.6 million and $19.9 million for the years ended December 31, 2017 and 2018, respectively, and net losses of $5.4 million and $5.7 million for the three months ended March 31, 2018 and 2019, respectively.

As of March 31, 2019, we had $33.2 million in cash and cash equivalents. From inception through March 31, 2019, we have funded our operations primarily through cash from operations, redeemable convertible preferred stock issuances, and debt issuances. After giving effect to the anticipated net proceeds from this offering, we expect that our existing cash and cash equivalents, anticipated cash flow from operations, and our $20.0 million financing facility will provide sufficient funds to sustain operations through at least the next 12 months. We have based these estimates on assumptions that may prove to be wrong, and we could exhaust our available capital resources sooner than we expect. See the section titled "Liquidity and Capital Resources; Plan of Operations."

Factors Affecting Our Performance

We believe there are several important factors that have impacted and that we expect will impact our operating performance and results of operations, including:

- **The continued development of the market for genomic-based tests.** Our performance depends on the willingness of biopharmaceutical customers to continue to seek more comprehensive molecular information to develop more efficacious cancer therapies.
- **Increasing adoption of our products and solutions by existing customers.** Our performance depends on our ability to retain and broaden adoption with existing customers. Because our technology is novel, some customers begin using our platform by initiating pilot studies involving a small number of samples to gain experience with our service. As a result, historically a significant portion of our revenues has come from existing customers. We believe that our ability to convert initial pilots into larger orders from existing customers has the potential to drive substantial long-term revenue. We expect there may be some variation in the number of samples they choose to test each quarter.
- **Adoption of our products and solutions by new customers.** While new customers initially may not account for significant revenues, we believe that they have the potential to grow substantially over the long term as they gain confidence in our service. Our ability to engage new customers is critical to our long-term success. Our publications, posters and presentations at scientific conferences lead to engagement at the scientific level with potential customers who often make the initial decision to gain experience with our platform. Accessing these new customers through scientific engagement and marketing to gain initial buy-in is critical to our success and gives us the opportunity to demonstrate the utility of our platform.

- **Our revenues and costs are affected by the volume of samples we receive from customers from period to period.** The timing and size of sample shipments received after orders have been placed is variable. Since sample shipments can be large, and are often received from a third party, the timing of arrival can be difficult to predict over the short term. Although our long-term performance is not affected, we do see quarter-to-quarter volatility due to these factors. Samples arriving later than expected may not be processed in the quarter proposed and result in revenue the following quarter. Since many of our customers request defined turnaround times, we employ project managers to coordinate and manage the complex process from sample receipt to sequencing and delivery of results. Our business can be seasonal, as we historically have received fewer samples during July and August.
- **Investment in product innovation to support commercial growth.** Investment in research and development, including the development of new products is critical to establish and maintain our leading position. In particular, we have invested in NeoantigenID, a neoantigen characterization report, ImmunogenomicsID, a broad biomarker report, and ImmunoID NeXT, our universal cancer immunogenomics platform. We are also collaborating with investigators from academic cancer centers, such as Inova Health System, Stanford Medicine, and the Parker Institute for Cancer Immunotherapy, to support the utility of our platform. We believe this work is critical to gaining customer adoption and expect our investments in these efforts to increase. We believe utility for our product may result in additional expenditures to develop and market new products, including a diagnostic or database.
- **Leverage our operational infrastructure.** We have invested significantly, and will continue to invest, in our sample processing capabilities and commercial infrastructure. With our current operating model and infrastructure, we can increase our production and commercialize new generations of our platform, but as our volumes continue to increase we will ultimately need to invest in additional production capabilities. We expect to grow our revenues and spread our costs over a larger volume of services. In addition, we may invest significant amounts in infrastructure to support new products resulting from our research and development activities.

Components of Operating Results

Revenues

We derive our revenues primarily from sequencing and data analysis services to support the development of next-generation cancer therapies. We support our customers by providing high-accuracy, validated genomic sequencing and advanced analytics. Many of these analytics are related to state-of-the-art biomarkers, including those relevant to immuno-oncology therapeutics such as checkpoint inhibitors.

Our revenues are primarily generated through contracts with companies in the pharmaceutical industry, healthcare organizations, and government entities. Our ability to increase our revenues will depend on our ability to further penetrate this market. To do this, we are developing a growing set of additional state-of-the-art products, advancing our operational infrastructure, building our regulatory credentials and expanding our targeted marketing efforts. Unlike diagnostic or therapeutic companies, we have not to date sought reimbursement through traditional healthcare payors. We sell through a small direct sales force.

We have one reportable segment from the sale of sequencing and data analysis services. Substantially all of our revenues to date have been derived from sales in the United States.

Revenues by customer type

Revenues by customer type were as follows:

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
	(in thousands)			
VA MVP	$ 421	$18,601	$1,977	$ 8,343
All other customers	8,972	19,173	2,187	5,732
Total	$9,393	$37,774	$4,164	$14,075

Revenues concentration

Our top five customers represented 45% and 82% of revenues in 2017 and 2018, respectively. Our top five customers represented 76% and 90% of revenues for the three months ended March 31, 2018 and 2019, respectively. Customers that accounted for equal to or greater than 10% of revenues in 2017 or 2018 and for the three months ended March 31, 2018 and 2019 were as follows:

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
VA MVP	*	49%	47%	59%
Merck & Co., Inc.	11%	12%	12%	*
Pfizer Inc.	*	10%	*	17%
Customer A	13%	*	*	*
Customer B	10%	*	*	*

* Less than 10% of revenues.

Accounts receivable concentration

As of December 31, 2017 and 2018 and as of March 31, 2018 and 2019, customers that accounted for greater than 10% of accounts receivable were as follows:

	As of December 31,		As of March 31,	
	2017	2018	2018	2019
Pfizer Inc.	13%	33%	11%	47%
Customer A	*	17%	*	*
Merck & Co., Inc.	38%	10%	22%	*
Customer B	*	10%	*	*
Customer C	13%	*	*	20%
VA MVP	*	*	38%	*

* Less than 10% of accounts receivable.

Costs and Expenses

Costs of revenues

Costs of revenues consist of production material costs, personnel costs (salaries, bonuses, benefits, and stock-based compensation), costs of consumables, laboratory supplies, depreciation and service maintenance on capitalized equipment, and information technology (“IT”) and facility costs. We expect the costs of revenues to increase as our revenues grow, but the cost per unit of data delivered to decrease over time due to economies of scale we may gain as volume increases, automation initiatives, and other cost reductions.

Research and development expenses

Research and development expenses consist of costs incurred for the development of our products. These expenses consist primarily of payroll and personnel costs (salaries, bonuses, benefits, and stock-based compensation), costs of consumables, laboratory supplies, depreciation and service maintenance on capitalized equipment, and IT and facility costs. These expenses also include costs associated with our collaborations, which we expect to increase over time.

We expense our research and development expenses in the period in which they are incurred. We expect to increase our research and development expenses as we continue to develop new products.

Selling, general, and administrative expenses

Selling expenses consist of personnel costs, customer support expenses, direct marketing expenses, educational and promotional expenses, and market research. Our general and administrative expenses include costs for our executive, accounting, finance, legal, and human resources functions. These expenses consist of personnel costs, audit and legal expenses, consulting costs, and IT and facility costs. We expense all selling, general, and administrative expenses as incurred.

We expect our selling expenses will continue to increase in absolute dollars, primarily driven by our efforts to expand our commercial capability and to expand our brand awareness and customer base through targeted marketing initiatives with an increased presence both within and outside the United States. We also expect general and administrative expenses will increase as we scale our operations. In addition, we expect to incur additional accounting, legal, director and officer insurance, and other expenses as a public company that we did not incur as a private company.

Interest Income

Interest income consists primarily of interest earned on our cash and cash equivalents.

Interest Expense

Interest expense primarily consists of cash and non-cash interest costs related to our term loan, convertible promissory notes, and revolving loan. We record costs incurred in connection with the issuance of debt as a direct deduction from the debt liability. We amortize these costs over the term of our debt agreements as interest expense in our consolidated statements of operations.

Loss on Debt Extinguishment

We incurred a loss on debt extinguishment in 2018 resulting from changes in the maturity dates of the convertible notes issued in 2017. See Note 6 to our consolidated financial statements included elsewhere in this prospectus.

Other Income (Expense), Net

Other income (expense), net consists of changes in the fair value of the compound derivative instrument, changes in fair value of convertible preferred stock warrant liability, and foreign currency exchange gains and losses. We expect our foreign currency gains and losses to continue to fluctuate in the future due to changes in foreign currency exchange rates.

Results of Operations

Comparison of the Years Ended December 31, 2017 and 2018 and the Three Months Ended March 31, 2018 and 2019

The following table summarizes our results of operations for the periods indicated:

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
	(in thousands, except share and per share data)			
Revenues	$ 9,393	$ 37,774	$ 4,164	$ 14,075
Costs and expenses				
Costs of revenues	11,736	25,969	4,065	10,091
Research and development	9,919	14,304	2,949	5,245
Selling, general, and administrative	9,901	11,271	2,313	4,170
Total costs and expenses	31,556	51,544	9,327	19,506
Loss from operations	(22,163)	(13,770)	(5,163)	(5,431)
Interest income	100	293	61	84
Interest expense	(1,303)	(1,894)	(622)	(184)
Loss on debt extinguishment	—	(4,658)	—	—
Other (expense) income, net	(227)	150	351	(152)
Loss before income taxes	(23,593)	(19,879)	(5,373)	(5,683)
Provision for income taxes	(5)	(7)	(2)	(2)
Net loss	$ (23,598)	$ (19,886)	$ (5,375)	$ (5,685)
Net loss per share, basic and diluted	$ (7.78)	$ (6.49)	$ (1.76)	$ (1.84)
Weighted-average shares outstanding, basic and diluted	3,031,636	3,063,157	3,051,581	3,091,342
Pro forma net loss per share, basic and diluted (unaudited)		$ (0.95)		$ (0.26)
Pro forma weighted-average shares outstanding, basic and diluted (unaudited)		20,483,543		21,754,727

Revenues

Comparison of the Years Ended December 31, 2017 and 2018

Revenues were $9.4 million for the year ended December 31, 2017 compared to $37.8 million for the year ended December 31, 2018, an increase of $28.4 million, or 302%. This increase in revenues was primarily due to an increase in the volume of samples we tested in relation to the sequencing and data analysis services we provided to our customers. The increase in samples tested was primarily due to additional volume from both existing and new customers, including an increase in the number of projects per customer. For the year ended December 31, 2018, revenues from existing customers and existing projects accounted for 58% of total revenues, and the remaining 42% of revenues was generated from new projects from our existing customers and new customers acquired in 2018.

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

Revenues were $4.2 million for the three months ended March 31, 2018 compared to $14.1 million for the three months ended March 31, 2019, an increase of $9.9 million, or 236%. This increase in revenues was primarily due to an increase in the volume of samples we tested in relation to the sequencing and data analysis services we provided to our customers. The increase in samples tested was primarily due to additional volume from both existing and new customers, including an increase in the number of projects per customer. For the three months ended March 31, 2019, revenues from existing customers and existing projects accounted for 10% of total revenues, and the remaining 90% of revenues was generated from new projects from our existing customers and new customers acquired in 2018 and 2019.

Costs of Revenues

Comparison of the Years Ended December 31, 2017 and 2018

Costs of revenues were $11.7 million for the year ended December 31, 2017 compared to $26.0 million for the year ended December 31, 2018, an increase of $14.3 million, or 121%. This increase was primarily due to the increase in revenues discussed above. The cost components related to the increase in costs of revenues were an increase in production materials of $9.6 million, an increase in depreciation and service maintenance on capitalized equipment of $2.0 million, an increase in expensed equipment, consumables, and laboratory supplies of $1.2 million, an increase related to personnel costs including salaries, bonuses, benefits, and stock-based compensation expenses of $1.0 million, and an increase in IT and facility costs of $0.5 million.

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

Costs of revenues were $4.1 million for the three months ended March 31, 2018 compared to $10.1 million for the three months ended March 31, 2019, an increase of $6.0 million, or 146%. This increase was primarily due to the increase in revenues discussed above. The cost components related to the increase in costs of revenues were an increase in production materials of $3.7 million, an increase related to personnel costs including salaries, bonuses, benefits, and stock-based compensation expenses of $1.1 million, an increase in depreciation and service maintenance on capitalized equipment of $0.6 million, an increase in the consumption cost of expensed equipment, consumables, and laboratory supplies of $0.4 million, and an increase in IT and facility costs of $0.2 million.

Research and Development Expenses

Comparison of the Years Ended December 31, 2017 and 2018

Research and development expenses were $9.9 million for the year ended December 31, 2017 compared to $14.3 million for the year ended December 31, 2018, an increase of $4.4 million, or 44%. This was primarily due to increased development activities for new product offerings, lab and automation development costs, and IT and facility costs. Research and development expenses increased due to an increase of $2.3 million in personnel-related expenses, including salaries, bonuses, benefits, and stock-based compensation expenses, a $1.1 million increase in IT and facility costs, a $0.8 million increase in laboratory and automation supplies consumed and equipment, and a $0.2 million increase in other costs.

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

Research and development expenses were $2.9 million for the three months ended March 31, 2018 compared to $5.2 million for the three months ended March 31, 2019, an increase of $2.3 million, or 79%. This was primarily due to increased development activities for new product offerings, lab and automation development costs, and IT and facility costs. Research and development expenses increased due to an increase of

$0.9 million in personnel-related expenses, including salaries, bonuses, benefits, and stock-based compensation expenses, a $0.9 million increase in laboratory and automation supplies consumed and equipment, a $0.3 million increase in depreciation and service maintenance on capitalized equipment and a $0.2 million increase in IT and facility costs.

Selling, General, and Administrative Expenses

Comparison of the Years Ended December 31, 2017 and 2018

Selling, general, and administrative expenses were $9.9 million for the year ended December 31, 2017 compared to $11.3 million for the year ended December 31, 2018, an increase of $1.4 million, or 14%. Selling, general, and administrative expenses increased due to a $1.0 million increase in personnel-related expenses including salaries, bonuses, benefits, and stock-based compensation expenses, a $0.2 million increase in professional services, and a $0.2 million increase in other costs.

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

Selling, general, and administrative expenses were $2.3 million for the three months ended March 31, 2018 compared to $4.2 million for the three months ended March 31, 2019, an increase of $1.9 million, or 83%. Selling, general, and administrative expenses increased due to a $1.3 million increase in personnel-related expenses including salaries, bonuses, benefits, and stock-based compensation expenses, a $0.5 million increase in professional services, and a $0.1 million increase in other costs.

Other Income (Expenses), Net

	Year Ended December 31,		Change	Three Months Ended March 31,		Change
	2017	2018	$	2018	2019	$
	(in thousands)			(unaudited)		
Changes in fair values of warrants for Series B and Series C convertible preferred stock	$ (64)	$ (391)	$ (327)	$ —	$ 134	$ 134
Changes in fair value of the compound derivative instrument	(162)	574	736	353	—	(353)
Other	(1)	(33)	(32)	(2)	18	20
Total other (expenses) income, net	$(227)	$ 150	$ 377	$ 351	$ 152	$ (199)

Comparison of the Years Ended December 31, 2017 and 2018

We had other expense, net of $0.2 million for the year ended December 31, 2017, compared to other income, net of $0.2 million for the year ended December 31, 2018, an increase of approximately $0.4 million, or 166.1%. This increase was driven by a decrease in the fair value of a compound derivative instrument of approximately $0.7 million in 2018, partially offset by an increase in the fair values of warrants for Series B and Series C redeemable convertible preferred stock of approximately $0.3 million.

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

We had other income, net of $0.4 million for the three months ended March 31, 2018, compared to other income, net of $0.2 million for the three months ended March 31, 2019. The decrease was primarily driven by a $0.4 million decrease in fair value of the compound derivative instrument partially offset by a $0.1 million increase in the fair values of warrants for Series B and Series C redeemable convertible preferred stock.

Liquidity and Capital Resources; Plan of Operations

Sources of Liquidity

From our inception through March 31, 2019, we have funded our operations primarily from $89.6 million from issuance of redeemable convertible preferred stock, as well as cash from operations and debt financing. In the year ended December 31, 2017, we received $12.2 million in gross cash proceeds from the issuance of convertible notes, and $5.0 million in gross cash proceeds from a revolving loan. On March 22, 2019, we received $20.0 million in gross cash proceeds from a growth capital loan. As of March 31, 2019, we had cash and cash equivalents in the amount of $33.2 million.

Future Funding Requirements

We have incurred net losses since our inception. For the years ended December 31, 2017 and 2018, we had net losses as of $23.6 million and $19.9 million, respectively, and for the three months ended March 31, 2018 and 2019, we had net losses of $5.4 million and $5.7 million, respectively, and we expect to incur additional losses in future periods. As of March 31, 2019, we had an accumulated deficit of $121.2 million. We believe that our existing cash, cash investments and anticipated cash flow from operations will provide sufficient funds to sustain operations through at least the next 12 months. See Note 16 to our audited consolidated financial statements included elsewhere in this prospectus.

We have based these future funding requirements on assumptions that may prove to be wrong, and we could utilize our available capital resources sooner than we expect. If our available cash 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 services or other risks described in this prospectus, we may seek to sell additional common or preferred equity or convertible debt securities, enter into an additional 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 stockholders 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.

The expected use of the net proceeds from this offering represents our intentions based upon our current plans and business conditions. However, we have based these estimates on assumptions that may prove to be wrong, and we could use our capital resources sooner than we expect.

Term Loan

In September 2014, we entered into a loan and security agreement with a bank (the “Term Loan”), to borrow up to $3.0 million under an equipment loan secured by the equipment financed. On October 3, 2014, we borrowed $2.4 million under this loan agreement. The Term Loan required 12 interest-only payments, followed by 36 equal monthly installments of principal, plus interest, which began on October 3, 2015.

In connection with the Term Loan, we issued a 10-year warrant to purchase 22,489 shares of our Series B redeemable convertible preferred stock at an exercise price of $4.60 per share.

On September 30, 2018, the Term Loan was repaid in full.

Revolving Loan

In June 2017, we entered into a $10.0 million revolving loan and security agreement (the “Revolving Loan”) with TriplePoint Capital LLC (“TriplePoint”). Borrowings under the Revolving Loan had an interest rate of

prime, plus 6.75%. The Revolving Loan also had a 5.5% end of term loan payment on the highest outstanding principal amount. The Revolving Loan required monthly interest-only payments until the maturity date. The Revolving Loan's original maturity date was December 31, 2018 and in December 2018 the maturity date was further extended until March 22, 2019. See Note 16 to our consolidated financial statements included elsewhere in this prospectus. The maturity date of the extension of the Revolving Loan was not deemed substantial therefore we accounted for the transaction as a debt modification.

As of both December 31, 2017 and 2018, our outstanding principal under the Revolving Loan was $5.0 million and $5.0 million was available to borrow.

In connection with the Revolving Loan, we issued a warrant to purchase up to 62,096 shares of our Series C redeemable convertible preferred stock at an exercise price of $8.052 per share. See Note 5 to our consolidated financial statements included elsewhere in this prospectus.

The Revolving Loan had an effective interest rate of 19.22% per year. The Revolving Loan interest expenses for the years ended December 31, 2017 and 2018 were $0.4 million and $0.9 million, respectively.

In March 2019, we entered into an amendment to the Revolving Loan with TriplePoint that provided for a $20.0 million growth capital loan facility (the "Growth Capital Loan"). In March 2019, we used $5.3 million of the Growth Capital Loan to repay all amounts owing in respect of the Revolving Loan.

Growth Capital Loan

On March 22, 2019, we entered into the Growth Capital Loan with TriplePoint to provide for a $20.0 million growth capital loan facility and as of March 31, 2019, had drawn down the full $20.0 million available under the facility. We used $5.3 million of the Growth Capital Loan to repay, in its entirety, all amounts outstanding under the Revolving Loan. Borrowings under the Growth Capital Loan bear interest at a floating rate of prime rate plus 5.00% for borrowings up to $15.0 million and the prime rate plus 6.50% for borrowing greater than $15.0 million; provided, however, that in an event of default, as defined in the loan and security agreement, the interest rate applicable to borrowings under such agreement will be increased by 5.0%. Under the agreement, we are required to make monthly interest-only payments through April 1, 2020 and are required to make 36 equal monthly payments of principal, plus accrued interest, from April 1, 2020 through March 1, 2023, when all unpaid principal and interest becomes due and payable. We may voluntarily prepay all, but not part, of the outstanding principal at any time prior to the maturity date, subject to a prepayment fee of 1% of the outstanding balance, if prepaid in months one through 12 of the loan term. If prepaid after month 12 of the loan term of any growth capital loan, no additional prepayment premium shall be due. In addition to the final payment, we will pay an amount equal to 2.75% of each principal amount drawn under this growth capital loan facility. In connection with the Growth Capital Loan, we issued a warrant to purchase 65,502 shares of common stock to the lender at an exercise price of $9.16 per share. We recorded the issuance-date fair value of the warrant of $0.6 million and fees paid to the lender of $0.3 million as a debt discount which is amortized over the term of the Growth Capital Loan using the effective interest rate method.

Upon issuance, the Growth Capital Loan had an effective interest rate of 15.23% per year.

Convertible Notes

On June 29, 2017, we entered into a convertible promissory note agreements (the "Convertible Notes") with certain existing redeemable convertible preferred stockholders and third parties (the "Investors") for the issuance of convertible promissory notes with a face value of $12.2 million. Under the terms of the Convertible Notes agreement, the Convertible Notes bear interest of 8% per annum, with a maturity date of June 28, 2018. In the event that we issued and sold shares of its equity securities (the "Equity Securities") to Investors on or before the maturity date in an equity financing with total proceeds to us of not less than $10 million (including the

conversion of the Convertible Notes or other convertible securities issued for capital raising purposes) (a "Qualified Financing"), then the outstanding principal amount of the Convertible Notes and any unpaid accrued interest would have automatically converted in whole without any further action by the holder into such Equity Securities sold in the Qualified Financing at a conversion price equal to the price paid per share for Equity Securities by the Investors in the Qualified Financing multiplied by 0.8. If we consummated a change of control while the Convertible Notes remained outstanding, we would have repaid the holders in cash an amount equal to 150% of the outstanding principal amount of the Convertible Notes, plus any unpaid accrued interest on the original principal. The Convertible Notes had customary events of default.

The conversion options of the Convertible Notes did not meet the requirements for separate accounting as an embedded derivative. However, the redemption features of the Convertible Notes met the requirements for separate accounting and were accounted for as a single, compound derivative instrument (see Note 9). The compound derivative instrument was recorded at fair value at inception and was subject to remeasurement to fair value at each consolidated balance sheet date, with any changes in fair value recognized in the consolidated statements of operations. The estimated fair value of the compound derivative instrument at issuance was recorded as a reduction in the carrying value of the Convertible Notes and as a single compound derivative liability. The Convertible Notes carrying value reduction was accreted using the effective interest method as interest expense over the Convertible Notes contractual period of one year. The Convertible Notes had an effective interest rate of 12.69% per year.

On May 31, 2018, the original maturity date for the Convertible Notes was extended to June 28, 2019 (previously June 28, 2018). The maturity date extension was deemed substantial and was accounted for as a debt extinguishment under Accounting Standards Codification ("ASC") Topic 470, *Debt*. In connection with the debt extinguishment on May 31, 2018, the fair value of the Convertible Notes was allocated between the carrying amount of the Convertible Notes and accrued interested of $13.1 million, a compound derivative asset of $0.6 million, and an equity component of $3.9 million, which was credited to additional paid-in capital within the consolidated statements of redeemable convertible preferred stock and stockholders' deficit. The transaction also resulted in a $3.3 million loss recorded as debt extinguishment in the accompanying consolidated statements of operations. The new carrying value of the Convertible Notes was accreted using the effective interest method as interest expense over the new contractual period of 1.1 years.

On August 20, 2018, the maturity date for the Convertible Notes was changed to September 20, 2018 (previously June 28, 2019). The term change was deemed substantial and was accounted for as a debt extinguishment under ASC Topic 470. In connection with the debt extinguishment on August 20, 2018, the fair value of the Convertible Notes was allocated between the new carrying amount of the Convertible Notes and accrued interest of $13.4 million, and an equity component of $0.8 million, which resulted in an additional credit to additional paid-in capital. The transaction also resulted in a $0.8 million loss recorded as debt extinguishment in the accompanying consolidated statements of operations. The new carrying value of the Convertible Notes was accreted using the effective interest method as interest expense over the new contractual period of one month.

On September 20, 2018, upon the maturity of the Convertible Notes, the carrying amount, including accrued interest of $13.4 million was converted into 1,667,997 shares of our Series C redeemable convertible preferred stock at a conversion price equal to $8.052 per share. No gain or loss was recorded on the conversion.

The interest expense on the Convertible Notes for the years ended December 31, 2017 and 2018, was $0.7 million and $0.9 million, respectively.

Summary Consolidated Statements of Cash Flows

The following table sets forth the primary sources and uses of cash and cash equivalents for each of the periods presented below:

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
		(in thousands)	(unaudited)	
Net cash provided by operating activities	$ 290	$ 5,572	$ 723	$ 66
Net cash used in investing activities	(5,158)	(7,852)	(1,309)	(960)
Net cash provided by (used in) financing activities	16,404	(591)	(189)	14,386

Net Cash Provided by Operating Activities

Net cash provided by operating activities during the year ended December 31, 2017 was $0.3 million, which resulted from a net loss of $23.6 million, offset by non-cash charges of $3.1 million and net change in our operating assets and liabilities of $20.8 million. Non-cash charges primarily consisted of $1.2 million of depreciation and amortization expense, $0.8 million of stock-based compensation expense, and $1.2 million of non-cash interest expense, change in fair value of compound derivative instrument and convertible preferred stock warrant liability. The net change in our operating assets and liabilities was primarily the result of a $19.1 million increase in customer deposits related to customer prepayments, a $3.3 million increase in accounts payable and accrued liabilities to support inventory and general expenses, partially offset by a $1.2 million increase in accounts receivables related to increases in revenue, a $0.5 million increase in inventory and deferred cost balances, and a decrease of $0.2 million in prepaid expense and other assets.

Net cash provided by operating activities during the year ended December 31, 2018 was $5.6 million, which resulted from a net loss of $19.9 million, offset by non-cash charges of $10.0 million and net change in our operating assets and liabilities of $15.4 million. Non-cash charges primarily consisted of $4.7 million of loss of debt extinguishment, $3.1 million of depreciation and amortization expense, $1.3 million of stock-based compensation expense, and $1.2 million of accretion of noncash interest, partially offset by $0.2 million of change in fair value of compound derivative instrument and convertible preferred stock warrant liability. The net change in our operating assets and liabilities was primarily the result of a $18.2 million increase in customer deposits related to customer prepayments, a $3.2 million increase in accounts payable and accrued liabilities to support inventory, and general expenses, partially offset by a $2.5 million increase in accounts receivables related to increases in revenue, a $2.1 million increase in inventory and deferred cost balances, and a $1.3 million decrease in prepaid expense and other assets.

Net cash provided by operating activities during the three months ended March 31, 2018 was $0.7 million, which resulted from a net loss of $5.4 million, offset by non-cash charges of $0.7 million and net change in our operating assets and liabilities of $5.3 million. Non-cash charges primarily consisted of $0.5 million of depreciation and amortization expense, $0.2 million of stock-based compensation expense, and $0.5 million of accretion of noncash interest, partially offset by $0.4 million of change in fair value of compound derivative instrument and convertible preferred stock warrant liability. The net change in our operating assets and liabilities was primarily the result of a $6.3 million increase in customer deposits related to customer prepayments, a $0.2 million decrease in accounts payable and accrued liabilities to support inventory, and general expenses, partially offset by a $0.2 million increase in accounts receivables related to increases in revenue, and a $1.0 million decrease in inventory and other deferred cost balances.

Net cash provided by operating activities during the three months ended March 31, 2019 was $0.1 million, which resulted from a net loss of $5.7 million, offset by non-cash charges of $2.0 million and net change in our

operating assets and liabilities of $3.7 million. Non-cash charges primarily consisted of $1.0 million of depreciation and amortization expense, $0.6 million of stock-based compensation expense, $0.2 million of change in fair value of convertible preferred stock warrant liability and change in accretion of noncash interest and debt reduction and $0.2 million of change in noncash lease expense. The net change in our operating assets and liabilities was primarily the result of a $1.4 million increase in customer deposits related to customer prepayments, a $0.8 million increase in accounts payable and accrued liabilities to support inventory, and general expenses, partially offset by a $1.3 million increase in accounts receivables related to increase in revenues, a $0.6 million increase in inventory and other deferred cost balances, and a $0.4 million decrease in prepaid expense and other assets.

Net Cash Used in Investing Activities

Net cash used in investing activities for 2017 was $5.2 million, which was primary related to the acquisition of property and equipment used for our sequencing and data analysis services.

Net cash used in investing activities for 2018 was $7.9 million, which was primary related to the acquisition of property and equipment used for our sequencing and data analysis services and facility expansion to support expanded operations.

Net cash used in investing activities for the three months ended March 31, 2018 was $1.3 million, which was primary related to the acquisition of property and equipment used for our sequencing and data analysis services and facility expansion to support expanded operations.

Net cash used in investing activities for the three months ended March 31, 2019 was $1.0 million, which was primary related to the acquisition of property and equipment used for our sequencing and data analysis services and facility expansion to support expanded operations.

Net Cash Provided by (Used in) Financing Activities

Net cash provided by financing activities was $16.4 million for the year ended December 31, 2017, which primarily consisted of $5.0 million borrowings under the Revolving Loan and $12.2 million from the Convertible Notes, partially offset by $0.8 million in debt repayment.

Net cash used in financing activities was $0.6 million for the year ended December 31, 2018, which primarily consisted of debt repayment.

Net cash used in financing activities was $0.2 million for the three months ended March 31, 2018, which primarily consisted of debt repayment.

Net cash provided by financing activities was $14.4 million for the three months ended March 31, 2019, which primarily consisted of $20.0 million borrowings under the Growth Capital Loan and $0.4 million from proceeds of exercise of stock options, partially offset by $5.0 million in debt repayment, $0.5 million in debt issuance costs, and $0.5 million in payment costs related to our initial public offering.

Contractual Obligations and Commitments

The following table summarizes our non-cancelable contractual obligations and commitments as of December 31, 2018:

	Payments Due by Period				
	Less than 1 year	1 to 3 years	3 to 5 years	More than 5 years	Total
	(in thousands)				
Debt obligations(1)	$ 5,270	$ —	$ —	$ —	$ 5,270
Operating lease obligations(2)	1,091	1,030	—	—	2,121
Purchase obligation(3)	17,073	—	—	—	17,073
Total	$ 23,434	$ 1,030	$ —	$ —	$ 24,464

(1) In June 2017, we entered into the Revolving Loan. Amount reflects the contractually required principal and interest payments. See Note 6 to our consolidated financial statements included elsewhere in this prospectus.

(2) We lease our facility under a non-cancelable operating lease. In February 2015, we entered into a lease for our current laboratory and office space that commenced in May 2015 and expires in November 2020. The minimum lease payments above do not include any related common area maintenance charges or real estate taxes. In November 2020, we may extend the lease at the then-current market rates.

(3) On November 22, 2017, we entered into a pricing agreement with Illumina to purchase certain consumables and equipment. As of December 31, 2018, in accordance with the contract, we had a purchase commitment of $17.1 million by June 30, 2019. On March 26, 2019, we entered into a new pricing agreement with this vendor, which replaced in its entirety the agreement dated November 22, 2017. The new pricing agreement has a commitment to purchase $1.7 million of equipment by June 30, 2019.

The contractual commitment amounts in the table above are associated with agreements that are enforceable and legally binding. Obligations under contracts that we can cancel without a significant penalty are not included in the table above.

We received $20.0 million in gross proceeds from the issuance of the Growth Capital Loan in March 2019, which is not included in the above table. Interest on the unpaid principal balance of the Growth Capital Loan accrues from the date of issuance, and compounds monthly at the effective rate of 15.23% per year.

The amounts in the table above do not include approximately $42.9 million and $44.3 million in customer deposits as of December 31, 2018 and March 31, 2019, respectively. These amounts included $37.3 million and $39.6 million from one customer as of December 31, 2018 and March 31, 2019, respectively, that we may be required to refund under certain circumstances. While customers have not historically required us to return prepaid amounts, if a customer that has prepaid us for future services cancels its contract with us or reduces the level of services that it expects to receive, we would generally be required to repay that customer's deposit with little or no notice. Because the requirement to return any deposits and the timing of any such repayments is uncertain, they have been excluded from the table above. If required to refund a deposit, we may not have the cash or other available resources to satisfy these repayment obligations. Even if we are able to satisfy the repayment obligation from available resources (including potentially a portion of the net proceeds of this offering), we may need to seek additional sources of capital to fund our operations which funding may not be available when needed or on acceptable terms. In either of those circumstances, our business, financial condition, results of operations, and reputation would be materially and adversely affected.

Quantitative and Qualitative Disclosures About Market Risk

Interest Rate Sensitivity

The market risk inherent in our financial instruments and in our financial position represents the potential loss arising from adverse changes in interest rates or exchange rates.

As of December 31, 2017 and 2018 and March 31, 2019, we had cash and cash equivalents of $22.6 million, $19.7 million and $33.2 million, respectively, consisting of cash held in bank accounts and money market funds denominated in U.S. dollars. A 100 basis point change in interest rates would not have a material effect on the fair market value of our cash and cash equivalents.

As of December 31, 2018, we are also exposed to market risk from changes in interest rates as a result of our indebtedness under the Revolving Loan, which matures on March 31, 2019. At December 31, 2017 and 2018, we had $5.0 million principal amount outstanding under the Revolving Loan. The interest rate associated with the Revolving Loan is the prime lending rate plus 6.75%. An immediate 100 basis point change in the prime interest rate would not result in a material impact on our results of operations for 2017 and 2018. See Note 6 to our consolidated financial statements for further description of the Revolving Loan.

We are also exposed to market risk from changes in interest rates as a result of our indebtedness under the Growth Capital Loan. At March 31, 2019, we had $20.0 million principal amount outstanding under the Growth Capital Loan. Borrowings under the Growth Capital Loan bear interest at a floating rate per annum equal to the prime rate plus 5.00% for borrowings up to $15.0 million and the prime rate plus 6.50% for borrowing greater than $15.0 million. An immediate 100 basis point change in the prime interest rate would not result in a material impact on our results of operations for the three months ended March 31, 2019. See Note 6 to our consolidated financial statements for further description of the Growth Capital Loan.

Foreign Currency Risk

The majority of our revenues is generated in the United States. As of December 31, 2017 and 2018 and March 31, 2018 and 2019, we had generated an insignificant amount of revenues denominated in foreign currencies. As we expand our presence in the international market, our results of operations and cash flows are expected to increasingly be subject to fluctuations due to changes in foreign currency exchange rates and may be adversely affected in the future due to changes in foreign exchange rates.

Critical Accounting Policies and Estimates

Our consolidated financial statements have been prepared in accordance with U.S. generally accepted accounting principles (“GAAP”). The preparation of these consolidated financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the consolidated financial statements, as well as the reported expenses incurred during the reporting periods. Our estimates are based on our historical experience and on various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions. We believe that the accounting policies discussed below are critical to understanding our historical and future performance, as these policies relate to the more significant areas involving management’s judgments and estimates.

While our significant accounting policies are described in the notes to our consolidated financial statements, we believe that the following critical accounting policies are most important to understanding and evaluating our reported financial results.

Revenue Recognition

Adoption of ASC Topic 606, “Revenue from Contracts with Customers”

On January 1, 2017, we early adopted the new accounting standard ASC Topic 606 using the full retrospective method. Results for reporting periods beginning after January 1, 2017, are presented under ASC Topic 606. The impact of adopting ASC Topic 606 was not material on our consolidated financial statements.

Revenue Recognition

We generate our revenues from selling sequencing and data analysis services. We agree to provide services to our customers through a contract, which may be in the form of a combination of a signed agreement, statement of work and/or a purchase order.

Upon adoption of ASC Topic 606, we have evaluated the performance obligations contained in contracts with customers to determine whether any of the performance obligations are distinct, such that the customers can benefit from the obligations on their own, and whether the obligations can be separately identifiable from other obligations in the contract. For all of our contracts to date, the customer orders a specified quantity of a sequencing; therefore, the delivery of the ordered quantity per the purchase order is accounted for as one performance obligation. Our contracts include only one performance obligation—the delivery of the sequencing and data analysis services to the customer.

Fees for our sequencing and data analysis services are predominantly based on a fixed price per sample. The fixed prices identified in the arrangements only change if a pricing amendment is agreed with a customer. In limited cases we provide our customers a discount if samples received are above a certain volume are purchased. In such cases, the discount applies prospectively. We have analyzed such discounts if they represent a material right provided to a customer. We have concluded that such discounts do not represent a material right provided to a customer since they are not deemed to be incremental to the pricing offered to the customer, or are not enforceable options to acquire additional goods. As a result, these discounts do not constitute a material right and do not meet the definition of a separate performance obligation. We do not offer retrospective discounts or rebates. Accordingly, all of the transaction price, net of any discounts, is allocated to one performance obligation. Therefore, upon delivery of the services, there are no remaining performance obligations.

Contracts that contain multiple distinct performance obligations would require an allocation of the transaction price to each performance obligation based on a relative stand-alone selling price basis. Sometimes we deliver sequencing results in two or more batches; however, since the quantity delivered per batch of each individual test per sales order in these instances is in the same ratio as in the original sales order, allocating the transaction price on the a relative stand-alone selling price basis would have no impact on the revenue recognized in any period presented.

We recognize revenue when control of the promised services is transferred to our customers. Management applies judgment in evaluating when a customer obtains control of the promised service, which is when the sequencing and data analysis service results are delivered to customers, at an amount that reflects the consideration to which we expect to be entitled to in exchange for those services. Revenue is recorded net of sales or other transaction taxes collected from clients and remitted to taxing authorities.

A customer contract liability will arise when we have received payments from its customers in advance, but has not yet provided genome and exome sequencing and data analysis services to a customer and satisfied its performance obligations. We record a customer contract liability for performance obligations outstanding related to payments received in advance for customer deposits. We expect to satisfy these remaining performance obligations and recognize the related revenues upon providing sequencing and data analysis services.

All of our revenues and trade receivables are generated from contracts with customers and substantially all of our revenues are derived from U.S. domestic operations. The following section describes the accounting policies that we believe have significant judgment, or changes in judgment, as a result of adopting ASC Topic 606.

Payment Terms

Payment terms and conditions vary by contract and customer. Our standard payment terms are typically less than 90 days from the date of invoice. In instances where the timing of our revenue recognition differs from the

timing of its invoicing, we have determined that our contracts do not include a significant financing component. The primary purposes of our invoicing terms are to provide customers with simplified and predictable ways of purchasing our services and provide payment protection for us.

Redeemable Convertible Preferred Stock

We record all shares of redeemable convertible preferred stock at their respective fair values on the dates of issuance, net of issuance costs. In the event of our voluntary or involuntary, liquidation, dissolution, or winding up, or a liquidation event such as a merger, acquisition and sale of all or substantially all of our assets, each of which we refer to as a deemed liquidation event, proceeds will be distributed in accordance with the liquidation preferences set forth in the amended and restated certificate of incorporation unless the holders of redeemable convertible preferred stock have converted their redeemable convertible preferred shares into common stock. Therefore, the redeemable convertible preferred stock is classified outside of permanent equity on the consolidated balance sheets as events triggering the liquidation preferences are not solely within our control. We have not adjusted the carrying values of the redeemable convertible preferred stock to the liquidation preferences of such shares because it is uncertain whether or when an event would occur that would obligate us to pay the liquidation preferences to holders of shares of redeemable convertible preferred stock. Subsequent adjustments to the carrying values to the liquidation preferences will be made only when it becomes probable that such a liquidation event will occur.

Convertible Preferred Stock Warrants

We account for warrants to purchase shares of our redeemable convertible preferred stock as liabilities at their estimated fair value because these warrants may obligate us to transfer assets to the holders at a future date upon a deemed liquidation event. The warrants are recorded at fair value upon issuance and are subject to remeasurement to fair value at each period end, with any fair value adjustments recognized in the consolidated statements of operations and comprehensive loss. We will continue to adjust the warrant liability for changes in fair value until the earlier of the exercise or expiration of the convertible preferred stock warrants, the completion of a deemed liquidation event, or the conversion of redeemable convertible preferred stock into common stock, or until holders of the redeemable convertible preferred stock can no longer trigger a deemed liquidation event. In connection with this offering, the convertible preferred stock warrants will be automatically converted into warrants to purchase shares of our common stock.

Common Stock Warrants

Our common stock warrants are classified as equity as they meet all criteria for equity classification. The common stock warrants are recorded at fair value upon issuance as additional paid-in-capital in the consolidated balance sheets. The common stock warrants are not remeasured after the issuance date. In connection with an initial public offering, the common stock warrants will remain outstanding unless voluntarily exercised by the holder.

Convertible Instruments

We evaluate and account for conversion options embedded in convertible instruments in accordance with ASC Topic 815, *Derivatives and Hedging Activities*. Applicable GAAP requires companies to bifurcate conversion options from their host instruments and account for them as freestanding derivative financial instruments according to certain criteria. The criteria include circumstances in which (a) the economic characteristics and risks of the embedded derivative instrument are not clearly and closely related to the economic characteristics and risks of the host contract, (b) the hybrid instrument that embodies both the embedded derivative instrument and the host contract is not remeasured at fair value under other GAAP with changes in fair value reported in earnings as they occur, and (c) a separate instrument with the same terms as the embedded derivative instrument would be considered a derivative instrument.

Stock-Based Compensation

We account for stock-based compensation arrangements with employees, using a fair value-based method, for costs related to all stock-based payments including stock options and stock awards. Our determination of the fair value of stock options on the date of grant utilizes the Black-Scholes option-pricing model.

The fair value of the option granted is recognized over the period during which an optionee is required to provide services in exchange for the option award, known as the requisite service period which usually is the vesting period, on a straight-line basis.

Estimating the fair value of equity-settled awards as of the grant date using valuation models, such as the Black-Scholes option-pricing model, is affected by assumptions regarding a number of complex variables. Changes in the assumptions can materially affect the fair value and ultimately how much stock-based compensation expense is recognized. These inputs are subjective and generally require significant analysis and judgment to develop.

- *Expected Term*—The expected term assumption represents the weighted-average period that the stock-based awards are expected to be outstanding. We have elected to use the "simplified method" for estimating the expected term of the options, whereby the expected term equals the arithmetic average of the vesting term and the original contractual term of the option.
- *Expected Volatility*—For all stock options granted to date, the volatility data was estimated based on a study of publicly traded industry peer companies. For purposes of identifying these peer companies, we considered the industry, stage of development, size, and financial leverage of potential comparable companies.
- *Expected Dividend*—The Black-Scholes option-pricing valuation model calls for a single expected dividend yield as an input. We currently have no history or expectation of paying cash dividends on its common stock.
- *Risk-Free Interest Rate*—The risk-free interest rate is based on the yield available on U.S. Treasury zero-coupon issues similar in duration to the expected term of the equity-settled award.

We estimated the fair value of the time-based employee stock options using the Black-Scholes option-pricing model based on the date of grant with the following assumptions:

Common Stock Valuations

The estimated fair value of the common stock underlying our stock options was determined at each grant date by our board of directors, with input from management. All options to purchase shares of our common stock are intended to be exercisable at a price per share not less than the per-share fair value of our common stock underlying those options on the date of grant.

In the absence of a public trading market for our common stock, on each grant date, we develop an estimate of the fair value of our common stock based on the information known to us on the date of grant, upon a review of any recent events and their potential impact on the estimated fair value per share of the common stock, and in part on input from an independent third-party valuation firm. As provided in Section 409A of the U.S. Internal Revenue Code of 1986, as amended (the "Code"), we generally rely on our valuations for up to twelve months unless we have experienced a material event that would have affected the estimated fair value per common share.

Our 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 "Practice Aid"). The methodology to determine the fair value of our common stock included estimating the fair value of the enterprise using the "backsolve" method, which estimates the fair value of our company by reference to the value and preferences of our last round of financing, as well as our capitalization.

The assumptions used to determine the estimated fair value of our common stock are based on numerous objective and subjective factors, combined with management's judgment, including external market conditions affecting the pharmaceutical and biotechnology industry and trends within the industry:

- our stage of development;
- the rights, preferences, and privileges of our redeemable convertible preferred stock relative to those of our common stock;
- the prices at which we sold shares of our redeemable convertible preferred stock;
- our financial condition and operating results, including our levels of available capital resources;
- the progress of our research and development efforts, our stage of development, and business strategy;
- equity market conditions affecting comparable public companies; and
- general U.S. market conditions and the lack of marketability of our common stock.

The Practice Aid identifies various available methods for allocating enterprise value across classes and series of capital stock to determine the estimated fair value of common stock at each valuation date. In accordance with the Practice Aid, we considered the following methods:

- *Income approach.* The income approach attempts to value an asset or security by estimating the present value of the future economic benefits it is expected to produce. These benefits can include earnings, cost savings, tax deductions, and disposition proceeds from the asset. An indication of value may be developed in this approach by discounting expected cash flows to their present value at a rate of return that incorporates the risk-free rate for the use of funds, the expected rate of inflation over the asset's holding period, and the risks associated with realizing the cash flows in the amounts and at the times projected. The discount rate selected is typically based on rates of return available from alternative investments of similar type and quality as of the valuation date. The most commonly employed income approach to valuation is the discounted cash flow analysis.
- *Market Approach.* The market approach attempts to value an asset or security by examining observable market values for similar assets or securities. Sales and offering prices for comparable assets are adjusted to reflect differences between the asset being valued and the comparable assets, such as, location, time and terms of sale, utility, and physical characteristics. When applied to the valuation of equity, the analysis may include consideration of the financial condition and operating performance of the company being valued relative to those of publicly traded companies or to those of companies acquired in a single transaction, which operate in the same or similar lines of business.
- *Cost Approach.* The cost approach to valuation is based upon the concept of replacement cost as an indicator of value and the notion that an investor would pay no more for an asset than what it would cost to replace the asset with one of equal utility. The cost approach estimates value based upon the estimated cost of replacing or reproducing the asset, less adjustments for physical deterioration and functional obsolescence, if relevant. When applied to an enterprise, a type of cost approach referred to as the Net Asset Method is sometimes employed. This method measures the value of equity as the sum of the values of its assets reduced by the sum of the values of its liabilities. The resulting equity is reflective of a 100% ownership interest in the business. This approach is frequently used in valuing holding companies.

Based on our early stage of development and other relevant factors, we considered all three approaches and have chosen to apply both income and market approaches in our analyses. We determined these approaches were the most appropriate methods for allocating our enterprise value to determine the estimated fair value of our common stock for valuations performed for periods as of December 31, 2018 or earlier. In determining the estimated fair value of our common stock, our board of directors also considered the fact that our stockholders could not freely trade our common stock in the public markets. Accordingly, we applied discounts to reflect the

lack of marketability of our common stock based on the weighted-average expected time to liquidity. The estimated fair value of our common stock at each grant date reflected a non-marketability discount partially based on the anticipated likelihood and timing of a future liquidity event.

Following the completion of this offering, our board of directors intends to determine the fair value of our common stock based on the closing quoted market price of our common stock on the date of grant.

Income Taxes

We account for income taxes under the asset and liability method. Deferred tax assets and liabilities are determined based on differences between the financial statement reporting and tax bases of assets and liabilities and net operating loss and credit carryforwards and are measured using the enacted tax rates and laws that will be in effect when such items are expected to reverse. Deferred income tax assets are reduced, as necessary, by a valuation allowance when management determines it is more likely than not that some or all of the tax benefits will not be realized.

We assess all material positions taken in any income tax return, including all significant uncertain positions, in all tax years that are still subject to assessment or challenge by relevant taxing authorities. Assessing an uncertain tax position begins with the initial determination of the position's sustainability and is measured at the largest amount of benefit that is greater than 50% likely of being realized upon ultimate settlement.

We have elected to account for the tax on Global Intangible Low-Taxed Income, enacted as part of the Tax Cuts and Jobs Act as a component of tax expense in the period in which the tax is incurred.

Off-Balance Sheet Arrangements

Since our inception, we have not engaged in any off-balance sheet arrangements, as defined in the rules and regulations of the Securities and Exchange Commission.

JOBS Act Accounting Election

We are an emerging growth company, as defined in the Jumpstart Our Business Startups Act (the "JOBS Act"). Under the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards issued subsequent to the enactment of the JOBS Act until such time as those standards apply to private companies. We have irrevocably elected not to avail ourselves of this exemption from new or revised accounting standards, and therefore, we will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

Recent Accounting Pronouncements

See the sections titled "Summary of Significant Accounting Policies—Recent Accounting Pronouncements" and "—Recent Accounting Pronouncements Not Yet Adopted" in Note 2 to our consolidated financial statements for additional information.

BUSINESS

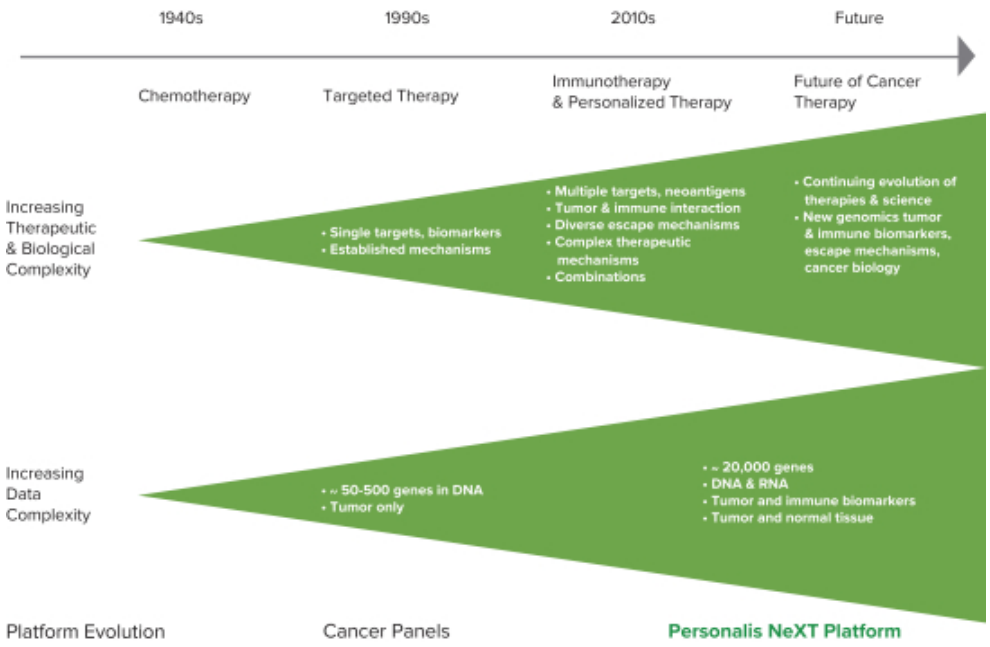
Overview

We are a growing cancer genomics company transforming the development of next-generation therapies by providing more comprehensive molecular data about each patient's cancer and immune response. We designed our NeXT Platform to adapt to the complex and evolving understanding of cancer, providing our biopharmaceutical customers with information on all of the approximately 20,000 human genes, together with the immune system, in contrast to many cancer panels that cover roughly 50 to 500 genes. We are also developing a complementary liquid biopsy assay that analyzes all human genes versus the more narrowly focused liquid biopsy assays that are currently available. By combining technological innovation, operational scale, and regulatory differentiation, our NeXT Platform is designed to help our customers obtain new insights into the mechanisms of response and resistance to therapy as well as new potential therapeutic targets. Our platform enhances the ability of biopharmaceutical companies to unlock the potential of conducting translational research in the clinic rather than with pre-clinical animal models or cancer cell lines. We are also planning to release a diagnostic based on our NeXT Platform that we envision being used initially by biopharmaceutical customers and clinical collaborators. Since inception, we have provided our services to more than 45 biopharmaceutical customers, including several of the largest pharmaceutical companies in the world.

In the past decade, the biopharmaceutical community has achieved major advances in the treatment of cancer, including approval of therapies capable of targeting specific genetic drivers of cancer and novel immunotherapies that empower the immune system to attack cancer cells. Despite these advances, the substantial majority of currently available cancer therapies have significant limitations, including efficacy only in certain subsets of patients, limited long-term survival rates, and significant toxicities. Moreover, the current research and development paradigm in oncology is beset by significant inefficiencies and substantial costs, with the average cost per patient in clinical trials reaching approximately $60,000. While tumor molecular profiling technologies have enhanced research and development efforts, most current tumor biopsy and liquid biopsy tests analyze a relatively narrow set of roughly 50 to 500 tumor genes, missing key genes and immune mechanisms underlying cancer therapy. With the lack of a comprehensive profiling solution, biopharmaceutical companies often attempt to use a disparate array of tests to compensate, resulting in a fragmented view of the tumor biology, insufficient tumor sample, logistical complexities, and increased costs. The resulting data heterogeneity makes it difficult to mine for new biological insights across cohorts of patients in clinical trials. These piecemeal approaches to tumor molecular profiling often result in solutions that are difficult to use at scale, especially in a clinical or therapeutic setting where simplicity, cost, turnaround time, and validation are important.

Our platform helps biopharmaceutical companies seeking to develop more efficacious therapies by comprehensively interrogating a patient's tumor and immune cells in detail, both to discover tumor vulnerabilities and elucidate potential therapeutic alternatives. To meet the demands of our customers, we built our NeXT Platform to be cost-effective and scalable with rapid turnaround times for tissue sample data and analytics. NeXT represents the next step of our existing ACE platform, allowing customers to move up the value chain by gaining more information from a single sample. We believe that our platform has the potential to enable a research, development, and treatment paradigm that is dynamic and adaptive to the evolving genomic and immune system landscape of patients' tumors over time. We believe our technology will drive this evolving paradigm, which will ultimately enable our customers to develop safer and more efficacious therapeutics (see Figure 1). As the clinical utility of our platform increases, we expect to grow our diagnostic capabilities, including the ability to guide therapy based on a patient's changing tumor and immune system, and supporting the commercialization of therapeutics developed by our biopharmaceutical customers.

Figure 1. Personalis NeXT Platform addresses the increasingly complex understanding of cancer.



Personalis: The Genomics Engine for Next-Generation Cancer Therapies

Biopharmaceutical customers use our comprehensive platform across a diverse set of therapeutic approaches to cancer. We generate and analyze data from patients who participated in clinical trials, which we believe will enable these customers to develop more effective therapies. These opportunities represent a significant end market that is much larger than our initial clinical-trial focused market, as the spending on cancer therapies and supportive care drugs for cancer increased to $133 billion globally in 2017.

The information we generate is important to our customers developing three major classes of next-generation therapeutics: immunotherapies, targeted therapies, and personalized cancer therapies. Based on the approximately 195,000 patients who are currently expected to enroll in the over 1,600 immunotherapy, targeted therapy, and personalized therapy clinical trials that commenced in 2018, we estimate the total addressable market for multiple time point comprehensive tissue and liquid biopsy testing in clinical trials is over $5.0 billion annually. See the section titled “Market, Industry, and Other Data” for additional information regarding the data, sources, and assumptions we used for this estimate.

- **Immunotherapies:** Over the past decade, a number of drugs have emerged based on the discovery that the immune system plays a key role in addressing cancer. Checkpoint inhibitors, a specific type of immunotherapy, generated worldwide sales of over $16.6 billion in 2018, up from approximately $1.4 billion in 2014. The commercial success of these drugs has shown the potential of immunotherapy; however, the development of new therapies in this category has been challenged by difficulties understanding the precise interaction between cancer and the immune system. The number of clinical trials in this space involving at least one cancer immunotherapy drug has grown from 123 that started in 2012 to 1,000 that started in 2018. Since our platform provides comprehensive insights on tumor and immune biology, we believe it will enable biopharmaceutical companies to better understand how therapeutics are working in patients.
- **Targeted Therapies:** A growing category of successful cancer treatments consists of therapies that target specific genes or molecular mechanisms of cancer. These drugs are not designed to influence the

immune system directly but the success of immunotherapies has brought acknowledgment that the immune system has a significant effect on their efficacy. Many of these targeted therapies are proposed to be tested in combination with immunotherapies. These therapies have grown to represent a considerable share of the overall oncology therapeutics market today. Comprehensively understanding each patient's genomic and immune profile is critical to understanding which of these therapies a patient may respond to. We believe that more comprehensive coverage of all of the approximately 20,000 genes positions us competitively against existing cancer panels that cover roughly 50 to 500 genes. We are positioning our company to be a leading provider of the complex information that we believe will continue to inform the development of targeted cancer therapies.

- **Personalized Cancer Therapies:** Many biopharmaceutical companies are pursuing personalized cancer therapies, which are designed and manufactured, individually, for each patient based on genomic alterations in a given patient's tumor. While there are many potential approaches to developing these therapies, including neoantigen-based vaccines and T-cell therapies, all of them can potentially benefit from the data and analytics that our platform can generate about a patient's tumor. Given the more than 700,000 cancer patients projected to be diagnosed with late-stage disease in the United States in 2019, we estimate that the total addressable market for our data and analytics for personalized cancer therapy could reach as much as $20 billion in the United States and as much as $40 billion worldwide. See the section titled "Market, Industry, and Other Data" for additional information regarding the data, sources, and assumptions we used for this estimate. Many of our customers have leveraged our U.S. Food and Drug Administration (the "FDA") Device Master File as a component of their investigational new drug ("IND") filings with the FDA. We anticipate that if drugs are approved that used our platform in the clinical trials forming the basis for approval, we may be able to derive revenue in connection with the sale of these drugs. We believe we are working with the majority of companies developing neoantigen-targeted personalized cancer therapies.

We anticipate that as the clinical utility of our platform is validated, we will have opportunities in connection with diagnostics and the commercialization of cancer therapeutics, which are significantly larger than our initial clinical-trial focused markets. Over time, we expect our biopharmaceutical customers and research collaborators to build evidence of clinical utility for our platform as a diagnostic for advanced cancer therapies. Separately, we are also acquiring samples and are building a database which will hold value for our biopharmaceutical customers and may ultimately allow us to discover new mechanisms of cancer treatment.

The NeXT Platform

Our NeXT Platform is designed to provide comprehensive analysis of both a tumor and its immune microenvironment, from a single limited tissue sample. Our platform covers the deoxyribonucleic acid ("DNA") sequence of all of the approximately 20,000 human genes. We also report on the entire transcriptome of a tumor, which encompasses ribonucleic acid ("RNA") expression across the approximately 20,000 human genes, allowing us to more accurately determine which of the many genomic mutations might actually be driving tumor progression. Furthermore, our platform analyzes elements of the immune cells that have infiltrated a tumor both from the adaptive immune system and the innate immune system.

Given the practical challenges in obtaining high-quality tumor samples via biopsy, we have developed our platform to work with a limited tumor tissue sample. Biopharmaceutical companies face significant challenges in attempting to divide samples to ship to multiple service providers to perform different tests. If a biopharmaceutical company is successful in acquiring results from multiple service providers, it is challenging to compare the results across multiple data platforms from multiple service providers. Our sequencing approach, validated with orthogonal technologies, allows us to run multiple analyses on a single sample. Our platform is composed of multiple proprietary technologies, many of which we have developed from the ground up. The breadth of the assays that we have integrated into our platform, our proprietary sample preparation process, and the comprehensiveness of our platform allow us to maximize the utility of often limited tumor tissue samples that our customers have from their clinical trials.

We have also shown that our technology can analyze cell-free DNA ("cfDNA") obtained from blood plasma, also known as a liquid biopsy. As with a tissue biopsy, we plan to analyze all of the approximately 20,000 human genes in each plasma sample, in contrast to currently marketed liquid biopsy panels. We are not aware of any other company that has publicly announced that they are developing a cell-free DNA ("cfDNA") platform that analyzes all of the approximately 20,000 human genes. We expect this cfDNA to be obtained by a blood draw concurrently with a tissue sample. Together, the two samples can be used to provide a more comprehensive initial characterization of the tumor. Additionally, we expect to monitor changes in tumor genetics that arise in response to therapy through serial measurements using cfDNA samples collected across multiple time points. In 2020, we plan to launch our first liquid biopsy assay designed to analyze all human genes so as to detect potential neoantigens and tumor escape mechanisms that arise under therapeutic pressure. Although we believe our cfDNA test will offer new insights, we believe it will be most useful for our biopharmaceutical customers alongside our primary tumor biopsy product, given that a tumor biopsy is required to analyze gene expression and elucidate tumor-infiltrating lymphocytes which are critical to understanding cancer's interaction with the immune system.

Our NeXT Platform was announced in late 2018, and the first revenues from this platform are expected in 2019.

Robust Operational Infrastructure to Scale with Our Customers

We have invested significant resources to develop an operational infrastructure that allows us to easily customize our services for each of our customers and scale rapidly to meet their potential research and commercial demands. Our NeXT Platform is complemented by our enterprise-grade software and bespoke information management systems that we tailor to meet our customers' unique needs and integrate with their workflows. Moreover, our infrastructure provides customers with visibility and control over processes, ensures consistency across all components used for the duration of each clinical trial, is traceable for compliance purposes, and allows us to scale while maintaining rapid turnaround times.

We designed our proprietary informatics system, the Symphony Enterprise Informatics System ("Symphony"), as a flexible and scalable enterprise-grade system used to manage the unique complexities and challenges of our genomics laboratory. Symphony integrates laboratory information management systems ("LIMS") and bioinformatics systems to connect laboratory operations with downstream data analysis. Symphony orchestrates all operational activities from our laboratory starting with sample receipt to the reporting of results of the genomic profiling and data delivery. We also use machine learning and artificial intelligence approaches to generate substantial performance advantages for our algorithms, such as neoantigen binding prediction.

We are sequencing and analyzing up to 100 trillion bases of DNA per week in our facility. We believe this capacity is already larger than most cancer genomics companies and we are building the automation and other infrastructure to scale further as demand increases and in support of the planned 2020 launch of our NeXT liquid biopsy assay.

Since 2012, we have been contracted to provide DNA sequencing and data analysis services to the United States Veterans Administration's (the "VA") Million Veteran Program (the "VA MVP"). The VA MVP began collecting samples in 2011 and is a landmark research effort aimed at better understanding how genetic variations affect health. Up to a million veterans are expected to enroll in the VA MVP study by 2021. With approximately 750,000 enrollees to date, the VA MVP exceeds the enrollment numbers of any single VA study or research program in the past, and is in fact one of the largest research cohorts of its kind. In September 2017, we entered into a one-year contract with three one-year renewal option periods with the VA for the VA MVP, and received orders under this contract in September 2017 and 2018. We are currently contracted to deliver approximately 80,000 genome sequence data sets to the VA MVP, and we expect revenue from the contracts awarded to date to continue into 2021. This relationship with the VA MVP has enabled us to scale our operational infrastructure and

achieve greater efficiencies in our lab. It has also supported our development of industry-leading, large-scale cancer genomic testing. The substantial experience that we have and expect to continue to develop in whole genome sequencing also optimally positions us for what we anticipate to be the longer-term strategic direction of the cancer genomics industry, which may include whole genome sequencing of tumors.

We believe our platform is well positioned to scale rapidly and substantially as the field of personalized cancer therapies matures. We believe that our platform could be essential to the composition and manufacture of any personalized cancer therapy developed using our platform. Furthermore, we expect that patients would be tested at multiple time points during the course of treatment: first to design a therapy according to an initial genomic profile generated from a tissue and/or liquid biopsy, and then as follow-up testing via liquid biopsy to detect any changes that would require therapy modifications after initial therapeutic interventions. If a therapy that uses our NeXT Platform achieves regulatory approval, we believe that our commercial opportunity may increase substantially.

Personalis is Valuable to Biopharmaceutical Companies

We believe that our platform is valuable to our customers because:

- **Our tumor and immune molecular profiling capabilities provide an unprecedented breadth of data from a single limited tumor sample.** We provide information on all of the approximately 20,000 human genes, as well as gene expression, the immune system, and other elements of cancer biology, in contrast to other currently marketed panels that cover a limited range of roughly 50 to 500 genes and do not focus on immune cells. The commercial success of immunotherapy drugs has demonstrated the need to better understand the immune system. Unfortunately, development of new therapies in this category has been challenged by difficulties understanding the precise interaction between cancer and the immune system. Since our platform provides comprehensive insights on tumor and immune biology, including in both innate and adaptive immune cells, we believe it will enable drug companies to better understand the biological effect of therapeutics in patients.
- **Our platform enhances the opportunity to conduct translational research by analyzing tumor tissues from patients in clinical trials, rather than animal models or in vitro cancer cell lines, which have historically limited cancer research.** While conventional pre-clinical model systems, such as animal models and cancer cell lines, have been instrumental in early-stage cancer research and drug development, translation of results to the clinic has been limited and remains a significant barrier to progress, in part because these models do not sufficiently reflect the complexity of human cancer and the human immune system. Over recent years, tools used to study tissue from patients have improved and the utilization of tissue from trials has increased. We believe our platform represents the next step in this transition by further enabling biopharmaceutical companies to address the historical limitations of analyzing patient tissue comprehensively.
- **The information we provide to personalized cancer therapy companies is used to design therapeutics.** Many biopharmaceutical companies are pursuing personalized cancer therapies, which are designed and manufactured, individually, for each patient based on genomic alterations in a given patient's tumor. While there are many potential approaches towards developing these therapies including neoantigen therapeutics, peptide-based vaccines, RNA and DNA vaccines, virally or bacterially encoded vaccines, and adoptive cell therapies, all of them benefit from the data and analytics that our platform can generate about a patient's tumor. We anticipate that drugs approved based on these therapeutic strategies may specify the use of our platform, enabling us to derive revenue in connection with the sale of commercial drugs, including the data generation and information processing required to treat each patient. We believe we are working with the majority of companies developing neoantigen-targeted personalized cancer therapies.
- **Our enterprise-grade operational infrastructure is scalable, enables rapid turnaround times, and is tailored to meet the unique workflow needs of our customers.** We have invested significant

resources to develop an operational infrastructure that allows us to easily customize our services for each of our customers and scale rapidly to meet their potential research and commercial demands. Moreover, our infrastructure provides customers with visibility and control over processes, ensures consistency across all components used for the duration of each clinical trial, is fully traceable for compliance purposes, and allows us to scale while maintaining rapid turnaround times.

- **We are developing a complementary liquid biopsy test, which also offers broad 20,000-gene coverage versus more narrowly focused liquid biopsy tests that are currently available.** We have also shown that our technology can analyze DNA obtained from blood plasma, also known as a liquid biopsy. As with a tissue biopsy, we analyze all of the approximately 20,000 human genes. We are not aware of any other company developing a cfDNA platform that analyzes all of the approximately 20,000 human genes. We expect this cfDNA to be obtained by a blood draw concurrently with a tissue sample. Together, the two samples can be used to provide a more comprehensive initial characterization of the tumor. Additionally, we expect to monitor changes in tumor genetics that arise in response to therapy through serial measurements using cfDNA samples collected across multiple time points. In 2020, we plan to launch our first liquid biopsy assay designed to monitor known neoantigens and detect novel neoantigens and tumor escape mechanisms that arise under therapeutic pressure.

Our Strategy

Our mission is to transform the development of next-generation cancer therapies by providing more comprehensive molecular data about each patient's tumor. To achieve this mission, our strategy is to:

- **Drive adoption of our platform by establishing and expanding relationships with leading developers of oncology therapeutics.** We believe that we can address the leading companies in oncology therapeutics with a small team of sales representatives and highly targeted marketing efforts. We augment this team with Ph.D.-level Field Application Specialists that provide deep understanding and expertise in the areas of oncology and genomics applications, allowing us to develop sciences-based dialog with our customers who are conducting clinical trials in many parts of their organizations. Once we have completed pilot studies with these customers, we work to expand our footprint by partnering with them on additional clinical trials using the newest versions of our technology. For example, we have successfully utilized this strategy with one of our large biopharmaceutical customers, with our revenues from this customer growing from approximately $473,000 during fiscal year 2017 to approximately $2.3 million during the three months ended March 31, 2019. We plan to continue to enter into such partnerships and pursue a publication strategy that further demonstrates the utility of our platform.
- **Invest in new product innovations and enhancements to maintain our leading position.** We will continue to make investments in new products that enhance our platform and further our competitive advantages. As the breadth of data used in drug development and cancer treatment becomes more and more complex, we believe our biopharmaceutical customers will look to our platform as a complete solution to drive efficiency in research and development. In 2020 we expect to launch a liquid biopsy test, which also offers broad 20,000-gene coverage versus the more narrowly focused liquid biopsy tests that are currently available.
- **Continue to build a body of evidence demonstrating the utility of comprehensive genomic data.** We expect the actionable information that customers gain from our platform will increase demand for our services. We intend to align ourselves with our customers, enabling them to develop better cancer therapeutics, which in turn demonstrates the utility of our platform. We expect this supportive cycle to increase our penetration into pharmaceutical and biotechnology enterprises over time.
- **Continue to grow our relationship with the VA MVP.** In addition to providing a stable source of revenue, our relationship with the VA MVP has enabled us to innovate, scale our operational

infrastructure, and achieve greater efficiencies in our lab. The substantial experience that we have and expect to continue to develop in whole genome sequencing also optimally positions us for what we anticipate to be the longer-term strategic direction of the cancer genomics industry.

- **Leverage a growing body of evidence from our platform to develop a diagnostic.** It is estimated that over 70% of oncology therapeutics in development are classified as personalized medicines, which require specific diagnostic testing prior to administration. We see a growing long-term diagnostic opportunity for NeXT as a one-stop, universal tumor profiling test for cancer patients. We are planning to release a diagnostic based on our NeXT Platform that we envision being used with biopharmaceutical and clinical partners.
- **Build out a comprehensive tumor-genomics database**. We also see a growing long-term opportunity to generate rich databases of content across a large number of cancer patients. Most current diagnostic based databases built using cancer panels cover just a small fraction of genes and miss information about the immune system whereas our platform will provide comprehensive information. This database would serve as a valuable tool to discover new cancer biology, new biomarkers, and potential therapeutic targets. It may include integration with other sources of real-world data ("RWD"), such as electronic health records, which can generate real-world evidence ("RWE") that may be used to reduce risk in early discovery by helping to identify biomarkers of response, improve trial execution through external control arms, expand indications for therapy, reduce trial size, and improve trial design.

Our Team

We have assembled a multidisciplinary team of experienced industry leaders to drive continuous innovation. Scientific and operational excellence is a guiding principle for our employees. As we have grown to over 145 employees, we have invested not only in the technology to provide information of sufficient quality for clinical use, but also in the people to continuously innovate for the industry's growing and changing demands.

Our President and Chief Executive Officer, John West, co-founded our company in 2011 in conjunction with four Stanford professors, Euan Ashley, M.D., Ph.D., Atul Butte, M.D., Ph.D., Russ Altman, M.D., Ph.D., and Michael Snyder, Ph.D. More broadly, our executive officers and management team members have had previous experience at a variety of genomics, pharmaceuticals, biotechnology, diagnostics, data analytics, service, enterprise software, and technology companies including Agilent Technologies, Inc., Applied Biosystems Inc., ARMO Biosciences, Inc., Illumina, Inc., Informatica LLC, Ingenuity Systems, Inc., Lumentum Holdings Inc., Merck & Co., Inc., Molecular Dynamics, Inc., Natera, Inc., Novartis Pharmaceuticals Corp., Pacific Biosciences of California, Inc., RainDance Technologies, Inc., and Solexa, Ltd.

Financial Highlights

Our revenues have grown rapidly as our penetration of clinical trials in advanced oncology therapeutics has expanded, consistent with our reputation as a leader in the field. We generated revenues of $9.4 million, $37.8 million, and $14.1 million for the years ended December 31, 2017 and 2018 and the three months ended March 31, 2019, respectively. We also incurred net losses of $23.6 million, $19.9 million, and $5.7 million for the years ended December 31, 2017 and 2018 and the three months ended March 31, 2019, respectively.

As of March 31, 2019, we had $33.2 million of cash and cash equivalents, an increase of $11.4 million from March 31, 2018. Our revenues are primarily generated through sales of our services to biopharmaceutical companies and the VA MVP. Unlike diagnostic or therapeutic companies, we have not sought reimbursement through traditional healthcare payors. We have raised $89.6 million in preferred stock equity financing to date.

Our Industry

Despite the large sums invested in research and despite new treatments, cancer remains a major challenge for modern medicine and a source of high unmet medical need. According to a 2018 American Cancer Society

report, “Cancer Facts & Figures,” as of January 1, 2016, there were more than 15.5 million people in the United States who were suffering from cancer or who had previously suffered from cancer, and more than 1.7 million people were expected to be diagnosed with the disease in 2018. Cancer prevalence is increasing globally as well. The World Health Organization (the “WHO”) predicted in its September 2018 estimates on the global prevalence of cancer that there would be 18.1 million new cancer cases and nearly 10 million cancer deaths globally in 2018. According to the WHO, the total economic impact of healthcare expenditure and loss of productivity resulting from cancer worldwide was approximately $1.2 trillion in 2010.

Improving Cancer Treatment is Increasingly About Leveraging Molecular Data

Despite the rapid evolution of cancer therapies, the current research and development paradigm in oncology is beset by significant inefficiencies and costs. Cancer therapeutics have one of the lowest clinical trial success rates of all major diseases. According to a study of 7,455 drug development programs during 2006 to 2015, the overall likelihood of FDA approval from Phase I clinical trial for oncology developmental candidates was 5.1%. The majority of currently available cancer therapeutics have serious limitations, including efficacy only in certain subsets of patients, limited long-term survival rates, and significant toxicities. The mechanisms underlying the success or failure of clinical trials are often poorly understood. To develop more efficacious cancer treatments, the biopharmaceutical community is faced with multiple key questions for a given therapeutic approach:

- Why do some patients respond to treatment and others do not?
- What are the underlying mechanisms of treatment resistance?
- Are there additional therapeutic targets or alternative pathways that can improve outcomes?
- What therapeutic combinations can improve outcomes?
- Are there ways to increase patient response through personalized therapeutics?
- Are there ways to reduce toxicity?

There is a growing recognition that there is a tremendous amount of untapped molecular data that can be derived from analyzing tumors from large numbers of cancer patients, whether in cancer clinical trials or post-commercialization, that can help answer some of these seminal questions and accelerate therapeutic development. The threefold increase in probability of FDA approval from Phase I clinical trial for therapies with biomarkers across all diseases and therapeutic types provides an indication of the benefits of leveraging molecular data.

Current Tumor Molecular Profiling Solutions Have Not Kept Pace with New Cancer Therapies

Biopharmaceutical companies are increasingly turning to tumor molecular profiling across large cohorts of patients to generate the data needed to answer these questions. Unfortunately, current tumor molecular profiling methods have not kept pace with new therapy development and overlook crucial elements of our evolving understanding of cancer biology.

Current tumor molecular profiling falls short for new cancer immunotherapies

Most current tumor molecular profiling panels were designed with a focus on targeted therapies, which, along with chemotherapy, have been used for cancer treatment for the past several decades. Targeted therapies treat cancers based on the specific genomic alterations driving their growth. Some targeted therapies have been developed to target specific molecules that are overexpressed or mutated in cancer cells. Because targeted therapies focus on cancer driver genes, the vast majority of tumor molecular profiling panels today, whether tissue or liquid biopsy based, typically sequence the DNA of between 50 to 500 genes, just a small fraction of the approximately 20,000 human genes.

Recently, however, transformational new approaches to cancer therapy that have been developed to harness the patient's own immune system have changed the treatment paradigm and our understanding of cancer biology. These new immunotherapies have dramatically improved the treatment of certain tumors that have previously been difficult to treat. Among these new immunotherapies, checkpoint inhibitors of the CTLA-4 and PD-1/PD-L1 genes are particularly effective. These therapies help "take the brakes off" the immune system and elicit a stronger immune response against the tumor. Patients can also be treated by adoptive cell therapy, in which the patient's immune system is supplemented with cytotoxic cells that have been programmed to attack cells expressing specific antigens on their tumors. There are also new opportunities for personalized cancer therapies where a new therapeutic vaccine or cell therapy is developed for each patient. Despite early success, the majority of patients today still do not respond to immunotherapy, underscoring the importance of gathering data that can help biopharmaceutical companies understand factors governing response and resistance to therapy.

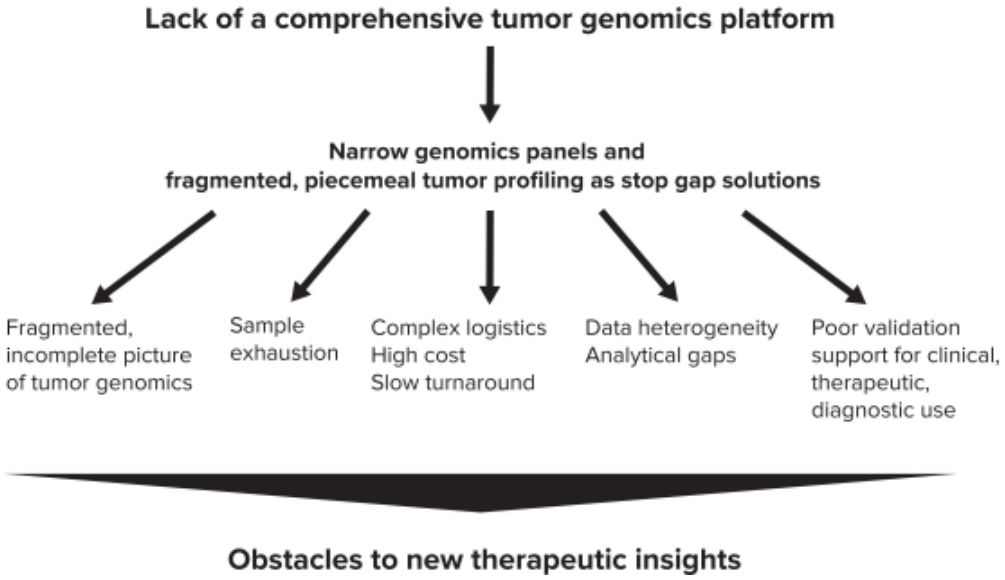
With these new immunotherapies and our rapidly evolving understanding of cancer biology, we believe the data needed to inform therapeutic development goes far beyond the typical 50 to 500 genes on current tumor molecular profiling panels. The paradigm has shifted from the need to understand mechanisms behind a single gene target to a dynamic, systems biology view involving complex interactions between thousands of genes in the tumor and the immune system in the pathogenesis of cancer and cancer drug response (see Figure 1).

Information about all of the approximately 20,000 human genes allows deeper insight into the biology of cancer, identifying novel or patient-specific therapeutic targets, including neoantigens, and predictive biomarkers of response to therapy. Understanding the immune cell signatures in the tumor microenvironment and immune repertoire changes is critical for understanding drug response. In addition to DNA, comprehensive RNA expression information from the tumor is needed to analyze complex pathways that may be activated in the tumor. It is important to identify the increasingly complex mechanisms of tumor response and resistance to cancer therapy, such as neoantigen burden, tumor antigens, deficient antigen presentation, oncogenic pathways, immune evasion pathways, HLA mutations, T-cell clonality, immune infiltration, and others. Table 1 describes some of the biological gaps in current panels. Most of these elements go beyond the capabilities of today's tumor molecular profiling panels.

Table 1. Most current tumor tissue and liquid biopsy profiling panels miss critical tumor and immune biology.

Key Gaps in Tumor Molecular Profiling Panels	Description
Too few genes sequenced, missed mutations	Most tumor molecular profiling panels (both tissue and liquid biopsy panels) focus on DNA sequencing of roughly 50 to 500 cancer driver genes, a fraction of the approximately 20,000 human genes that can harbor tumor mutations.
Lack of RNA coverage	RNA expression signatures are important biomarkers of therapy response.
No immune repertoire	The immune repertoire of the tumor helps in understanding responses to cancer therapies.
No germline genome	The normal ("germline") genome can contain pertinent information for understanding therapy response and providing a clear view of which mutations are only in the cancer.
Missed neoantigens	Neoantigens are tumor-specific antigens that can trigger an immune response against a tumor.
Missed tumor escape mechanisms, biomarkers	Tumor escape mechanisms may be critical to new immunotherapies and personalized therapies. This includes HLA mutations, MSI, TCR clonality, antigen processing machinery pathways, immune signatures, and other immuno-modulators.
Limited view of the innate immune system	Immune cell expression signatures are important biomarkers of therapy response.

Figure 2. Lack of a comprehensive tumor molecular profiling platform leads to major challenges for cancer therapy development.



Fragmented tumor molecular profiling approaches result in a fragmented view of biology and limited insights

With the lack of a comprehensive profiling solution, biopharmaceutical companies often turn to fragmented, piecemeal approaches to tumor molecular profiling as a stopgap measure (see Figure 2).

Those fragmented tumor molecular profiling approaches lead to major problems for therapeutic development. Limitations in available tumor samples, including liquid biopsies, force scientists to pick and choose which profiling platforms to include and which to omit, resulting in a fragmented picture of the biology. Fragmented profiling solutions also result in inconsistent profiling from patient to patient, and clinical trial to clinical trial. This results in data heterogeneity that makes it difficult to mine for new biological insights across cohorts of patients in trials. Finally, these piecemeal approaches to tumor molecular profiling result in solutions that often are difficult to use at scale in a clinical or therapeutic setting where logistical simplicity, cost, turnaround time, and validation are important.

Current tumor molecular profiling panels can become antiquated with evolving science

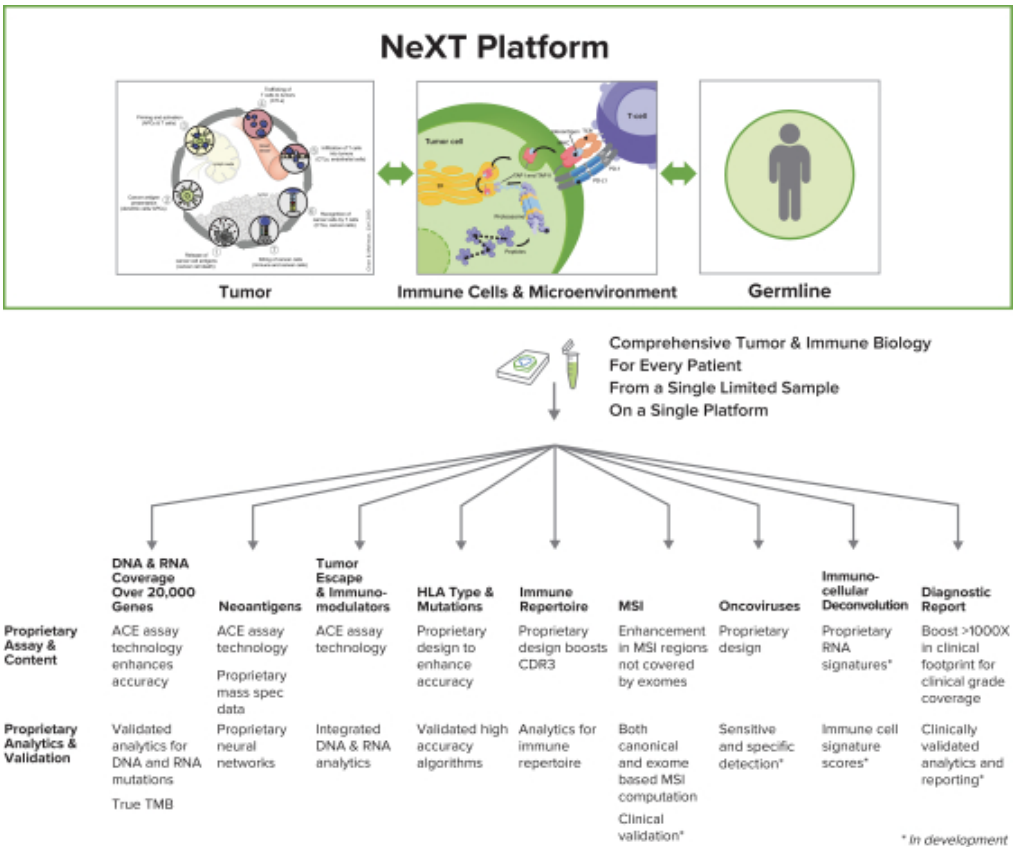
With the explosion of immunotherapy and advances in our understanding of cancer, new insights into the underlying mechanisms of response and resistance have emerged. New putative genetic or immune biomarkers of response are regularly identified for different therapies in the context of different cancers. For instance, new biomarkers have been identified including tumor mutational burden, neoantigens, HLA type, B2M mutations, TGFß, JAK1/JAK2 mutations, expression signatures, cytotoxicity signatures, and T-cell clonality, among others. A recent Nature Medicine review identified 18 different categories of biomarkers correlating with immunotherapy response spanning tumor, immune cells, and the tumor microenvironment. Due to the limited coverage of most cancer panels, they may miss new biomarkers. We believe this problem will continue as research uncovers new insights into cancer.

Our Platform: Advanced Tumor Molecular Profiling Built for the Future of Cancer Therapy

Our NeXT Platform ushers in a new paradigm for tumor molecular profiling by looking beyond the roughly 50 to 500 genes that limit current tumor profiling solutions. NeXT is designed to elucidate both the tumor genomics and its immune microenvironment simultaneously, representing a major step forward in tumor molecular profiling. Our platform interrogates all of the approximately 20,000 human genes in each tumor, generating more comprehensive molecular information than current profiling panels, from a single limited tumor sample. We have built NeXT to not only address the complex biology of new immunotherapies, but also to be broad enough to accommodate our rapidly evolving and increasingly complex understanding cancer. Finally, through technology innovation, we have made comprehensive tumor molecular profiling cost-efficient and scalable, enabling its use for large-scale profiling of cancer patients.

NeXT enables a paradigm where each cancer patient can benefit from comprehensive tumor molecular profiling, providing important data for cancer therapy development, personalized therapies, therapy selection, and diagnostics. Our platform enables biopharmaceutical customers to increase the insights generated from each tumor sample, reduce data heterogeneity, and simplify the process of tumor analysis. Our platform can be used to advance therapeutic development by elucidating diverse mechanisms of tumor escape, detecting neoantigens, identifying novel biomarker signatures, and characterizing the immune response.

Figure 3. The NeXT Platform generates the most comprehensive view of the tumor and immune biology today, all from a single limited sample.



NeXT Platform: Overview of Key Features & Differentiators

Comprehensive tumor and immune genomics from a single limited sample

- Sequencing and analyzing all of the approximately 20,000 human genes generates more comprehensive molecular information than current tumor tissue and liquid biopsy panels focused on roughly 50 to 500 genes
- Covers a much broader set of biomarkers for new immunotherapies and traditional targeted therapies
- Analysis of both tumor DNA and RNA expression
- Analysis of both tumor and normal tissue
- Analysis of non-human species such as oncoviruses (analytics in development)
- NeXT liquid biopsy, which we plan to launch in 2020, will target approximately 20,000 genes, enabling testing at multiple time points
- Proprietary technology enables superior sequencing quality and advanced analytics

Makes single, comprehensive tumor molecular profiling practical for cancer patients

- Tumor and immune molecular profiling from one limited tumor sample
- Engineered to be cost-effective and scalable, with rapid turnaround times, making it suitable for large-scale profiling of cancer patients
- Overcomes the need for fragmented tumor testing
- One platform for both research and clinical use

Platform anticipates future cancer biomarkers that will come with evolving science

- NeXT overcomes the limitations of small panels that become out of date when new genetic biomarkers or therapeutic targets are identified
- Comprehensive coverage of all genes, DNA and RNA, tumor and normal tissue, and immune biology enables our platform to accommodate new genetic biomarkers and signatures as they are published

Generates comprehensive, harmonized data across patients to enable large-scale database creation and insight

- Comprehensive profiling for large cohorts of patients leads to more useful databases for biopharmaceutical customers using our platform and our internal database
- Opportunity for integration with other sources of RWD such as electronic health records to generate RWE that may be used by biopharmaceutical customers to inform and accelerate therapeutic development
- Data harmonization, analytics, and machine learning maximize therapeutic insight
- Comprehensive nature of the platform provides long-lasting data relevance, yielding new insights over time as new biomarkers are identified

NeXT Platform: Advanced Tumor Molecular Profiling Built for Present and Future Cancer Therapies

To elucidate the complexity of tumor and immune biology, we have developed many new technologies that enable our platform to generate and analyze an order of magnitude more genomic data than most other cancer panels (see Figure 4). Our proprietary technologies and innovations span the entire NeXT Platform, including sample sparing preparation, advanced genomic sequencing, and new analytics with machine learning algorithms. We have also developed proprietary software and automation to integrate and scale the data, complex assays, analytics, and workflows underlying the platform (see Figure 5).

Figure 4. The order of magnitude increase in biological complexity, data size and analytical complexity has required innovation throughout the entire NeXT Platform.

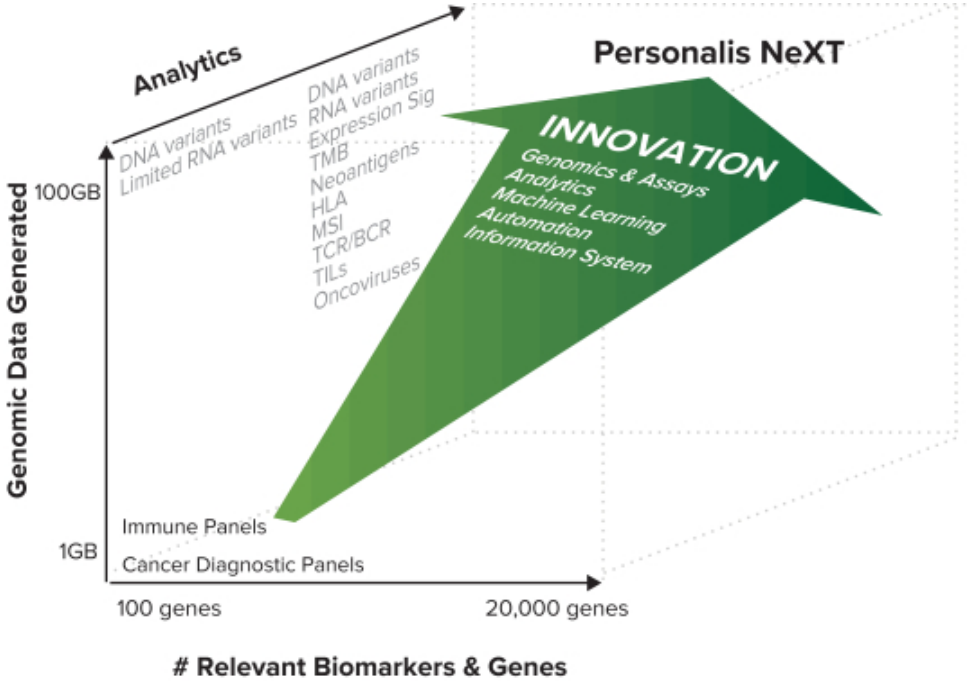
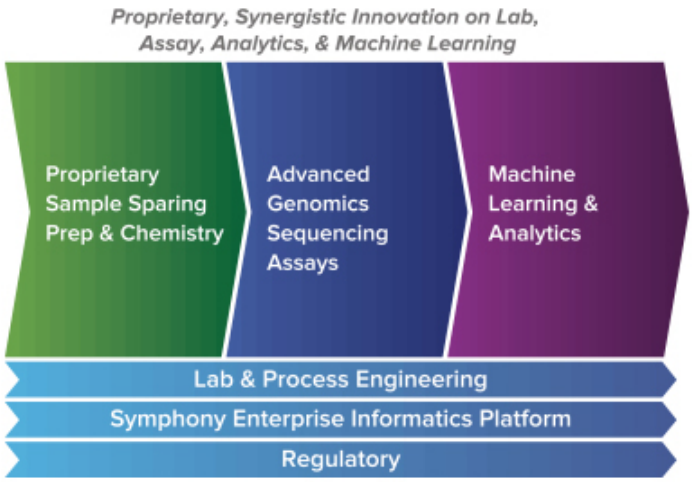
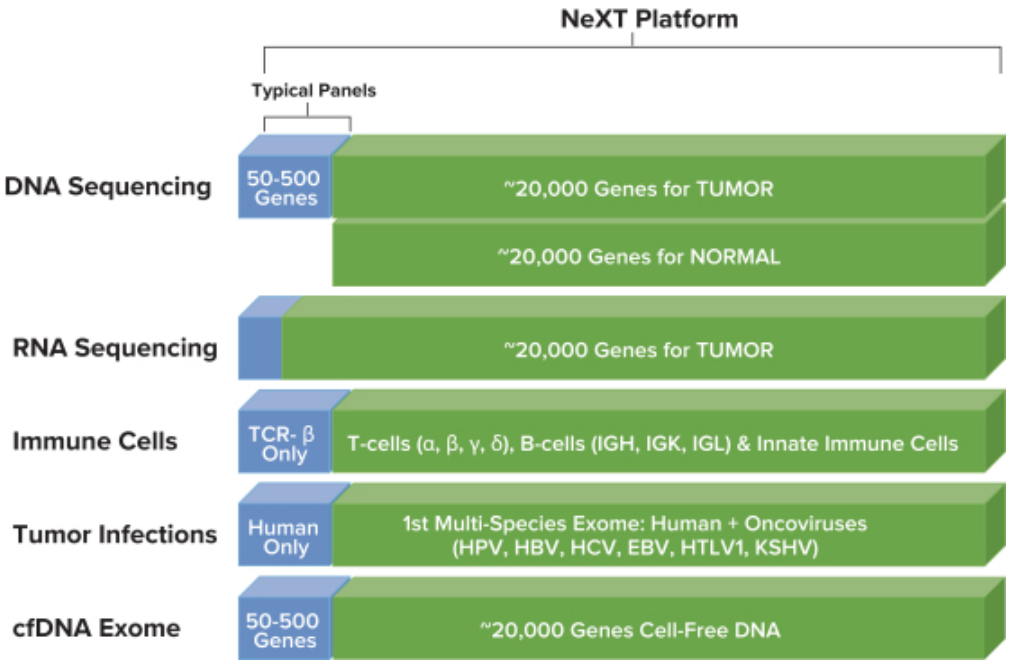


Figure 5: Areas of innovation across the NeXT Platform.



Through our technology innovation, proprietary methods, and intellectual property, our platform is capable of detecting mutations across all of the approximately 20,000 human genes in both DNA and RNA, immune repertoire for TCR a, ß, g, d and BCR l, k, immune signatures, diverse tumor escape mechanisms, and oncoviruses (in development). Compared to traditional cancer panels, our platform is broader in multiple dimensions.

Figure 6. NeXT generates broader biological insight than existing panel approaches.



Covers Biomarkers for Current and Future Therapies Through Broad Sequencing and Analysis of Approximately 20,000 Human Genes

Far beyond current cancer panels focused on roughly 50 to 500 genes, our platform sequences all of the approximately 20,000 human genes, enabling a broader view of tumor and immune genomics. Mutations of all types including single nucleotide variants, insertion-deletions, fusions, and copy number variations have been implicated in tumor resistance and response mechanisms for both targeted cancer therapies and immunotherapies, and thousands of these mutations can occur in each tumor. Our platform can identify crucial tumor and immune biomarkers, including in the tumor microenvironment, related biomarkers and critical alterations in the antigen presenting machinery, DNA repair and replication, immune checkpoint modulation, tumor associated antigens, immune response, microsatellite instability, cytokines and chemokines, and cytotoxicity.

Simultaneously Provides Both Tumor and Immune Insights, including T and B Cell Repertoire

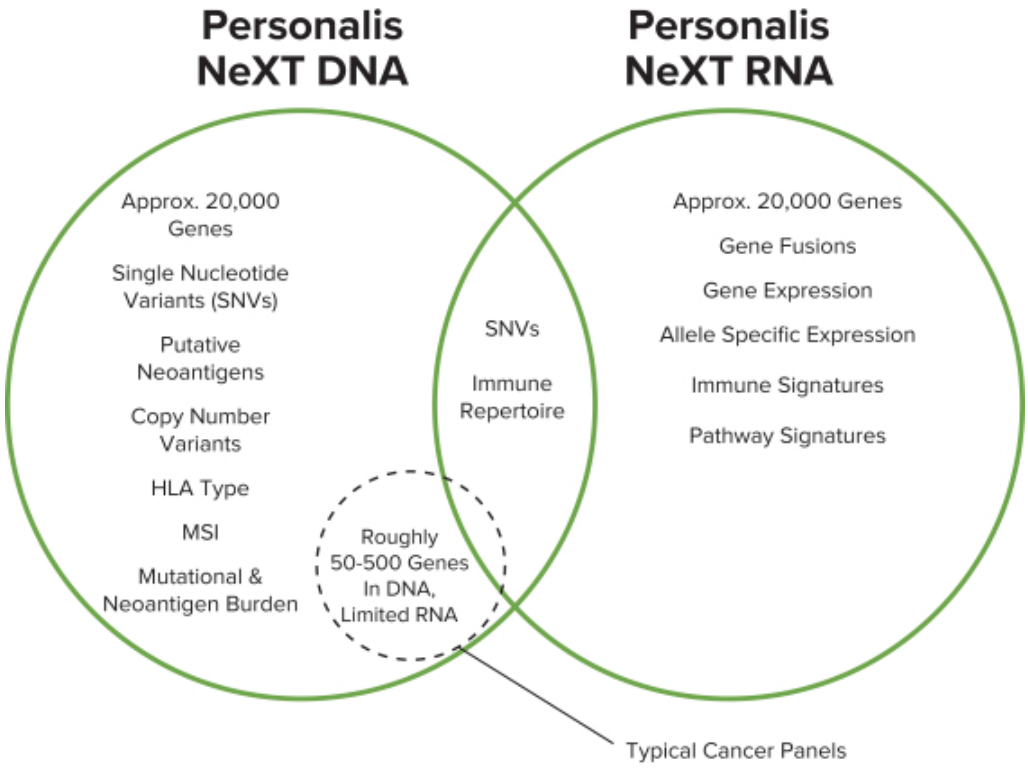
Simultaneously understanding both the tumor cells and the immune cells is critical for a deeper understanding of patient response to therapy. Unlike most cancer profiling panels that are focused on the tumor or immune repertoire alone, NeXT interrogates both the tumor and immune repertoire simultaneously. This is crucial as both the tumor and immune microenvironment can impact therapy response. Our platform sequences the broad immune repertoire including TCR a, b, g, d and BCR l, k from tumor FFPE (and fresh frozen) samples. The immune repertoire specific sequencing data derived from the NeXT assay is processed by our analytics, and a report is generated providing key metrics such as clonality, CDR3 nucleotide and amino acid

sequences, clonotype quantitation, distribution, and frequency, V, D, and J gene segments usage and overlap, and CDR3 nucleotide sequence length. These deliverables enable researchers to investigate the immune repertoire's potential as a predictive biomarker of response to immunotherapies and combination therapies.

Analyzes Both DNA and RNA for a Patient's Tumor

In contrast to most cancer diagnostic panels, the NeXT Platform sequences and analyzes both the DNA and RNA, which is extracted from the same limited sample. As shown in Figure 7, DNA and RNA sequencing data yields complementary insights into the tumor and immune genomics, providing a more complete view of tumor features that can impact cancer therapy. Furthermore, by simultaneously looking at both, there are new opportunities to combine information to improve analytical results for neoantigens and other advanced biomarkers, which can include multi-gene signatures.

Figure 7. DNA and RNA from our platform yield different but synergistic insights into the tumor and immune genomics.



Analyzing Both Tumor and Normal Tissue

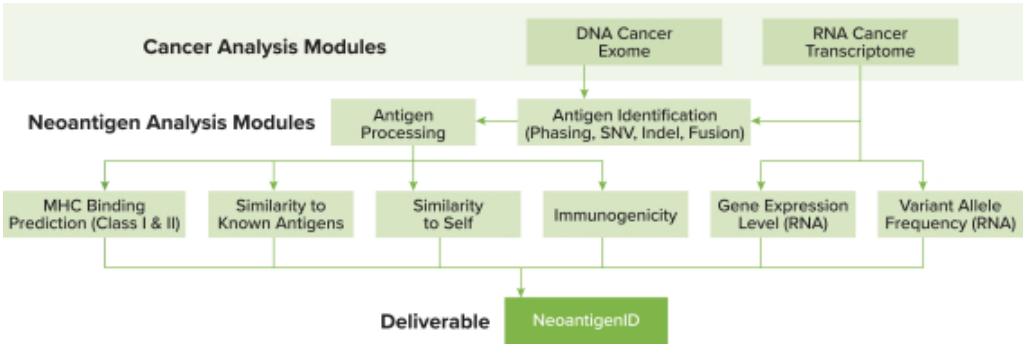
Most cancer panels do not sequence the genome of the patient's non-cancer tissue ("normal tissue"), which can contain pertinent information for understanding therapy response. By analyzing the normal tissue from the patient (typically blood samples), we improve the accuracy of identifying cancer specific mutations by using genetic variants found in the normal tissue as a reference point. Panels that do not utilize the normal tissue as a reference point can mistake germline mutations for cancer mutations. Furthermore, the normal tissue can yield additional genetic information that may be relevant to interpreting cancer therapy response. One example of this is HLA type, which has been correlated with response to immunotherapy. Germline mutations can also predispose patients to cancer.

Analysis of Neoantigens with Proprietary Assay Design and Machine Learning Algorithms

Neoantigens are derived from tumor-specific mutations that vary from patient to patient and can potentially trigger an immune response to the tumor. When neoantigens bind to and are presented on the major histocompatibility complex ("MHC") on cells, they can be recognized as "foreign" by the immune system and elicit an immune response to the tumor. Because of this, neoantigens have attracted strong biopharmaceutical interest as both a therapeutic target for personalized therapies and a biomarker for drug response. The predicted neoantigen burden in tumors has also been reported to be a biomarker of response of immunotherapies in certain cancers. Many neoantigens are missed by narrow cancer panels because they can arise from mutations in any of the approximately 20,000 human genes.

To enable these applications, we have developed proprietary methods to better identify and characterize neoantigens from a patient tumor sample. We have designed proprietary assay and algorithmic elements in NeXT including enhanced DNA and RNA sequencing technology, HLA typing, MHC-binding prediction, similarity-to-self, similarity-to-known antigens, and immunogenicity that are all used to improve detection and characterization of potential neoantigens.

Figure 8. Our neoantigen prediction engine combines proprietary assay design and proprietary analytics to identify and characterize neoantigens.



The MHC-binding prediction for each candidate neoantigen is a particularly critical step in the neoantigen characterization process. There are multiple variants ("alleles") of MHC proteins present in any individual and these alleles also vary between individuals. Each MHC variant has a unique set of peptides or neoantigens that it can present to the immune system. If an individual does not have an MHC allele that can bind to a particular neoantigen it will not be able to trigger an immune response to the tumor.

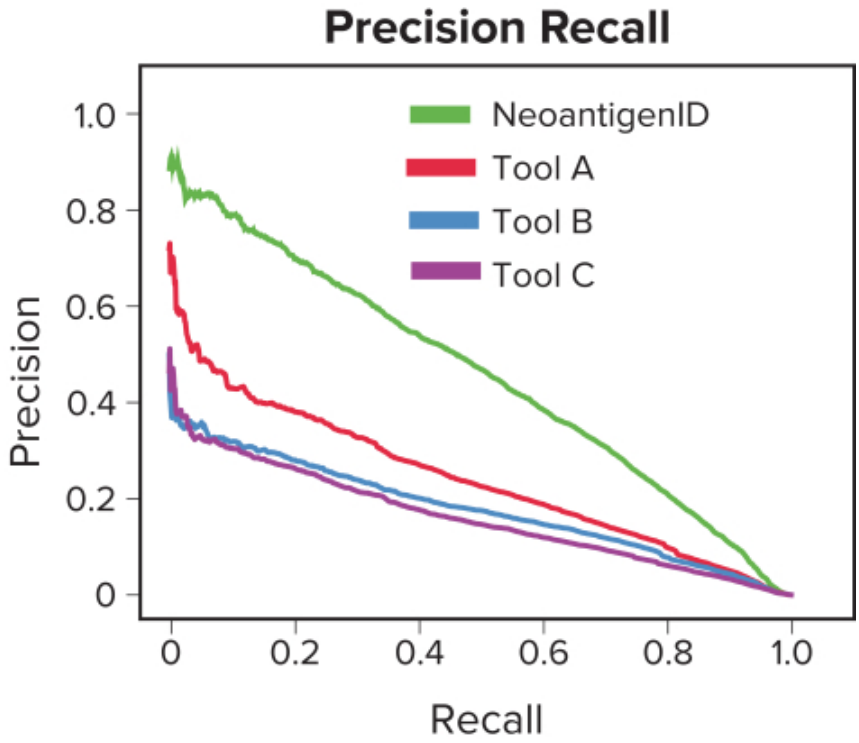
While academic groups have developed machine learning algorithms that can help predict the binding of peptides to individual MHC alleles, these algorithms were built upon data that was obtained from many different sources and was of limited quantity and varying quality. To address the limitations of existing tools, we have generated our own MHC binding data and used this high quality, systematically collected data as the basis for training our machine learning algorithms.

We have engineered proprietary cell lines that express only one MHC allele at a time and used a combination of chromatography and mass spectrometry to determine which peptides are bound to each allele. We believe we have one of the most comprehensive databases of peptide binding to specific MHCs of this type. We use this data and our computational tools to build proprietary peptide binding predictions that are individualized for each MHC allele.

As seen in Figure 9, our MHC neoantigen binding predictions perform more accurately than the best publicly available prediction tools. A good prediction algorithm should be able to accurately identify peptides

that are well known to bind to a specific MHC receptor. There are two ways to measure the power of a neoantigen prediction algorithm: the ability to accurately identify a given neoantigen as binding to a specific MHC, known as precision (which is a measure of how likely the predicted binding is to be correct, meaning true positives divided by true positives plus false positives), and the ability to find all known neoantigens that bind to that MHC, known as recall (which is a measure of how likely binders will be found, meaning true positives divided by true positives plus false negatives). We attribute the increased accuracy of our predictions to the high quality of the data we have generated, as well as our proprietary machine learning algorithms.

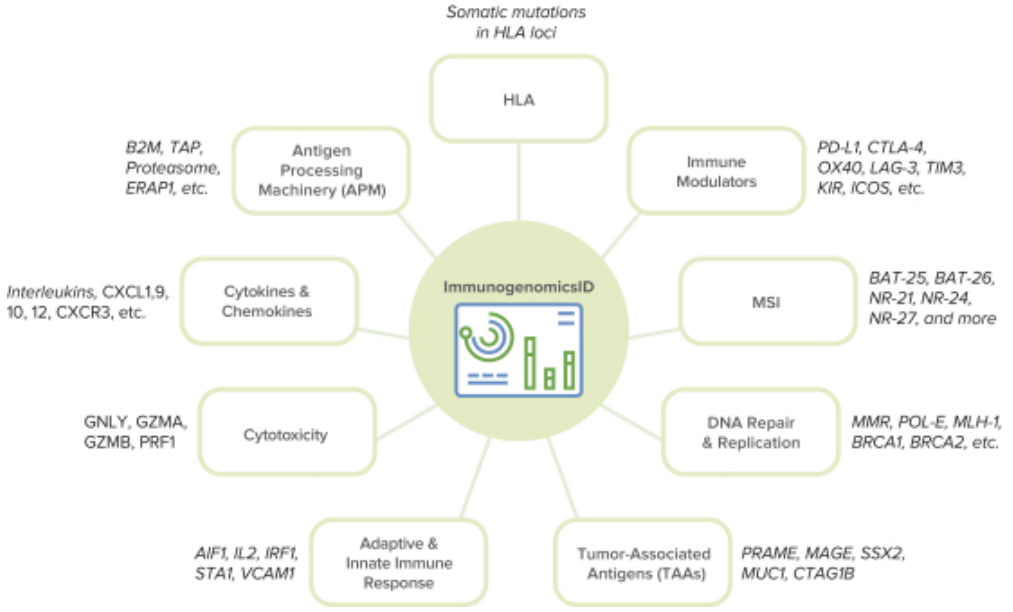
Figure 9. Predictive power of our MHC neoantigen binding method compared to standard methods.



Elucidating a Broad Set of Biomarkers Spanning Tumor and Immune Biology

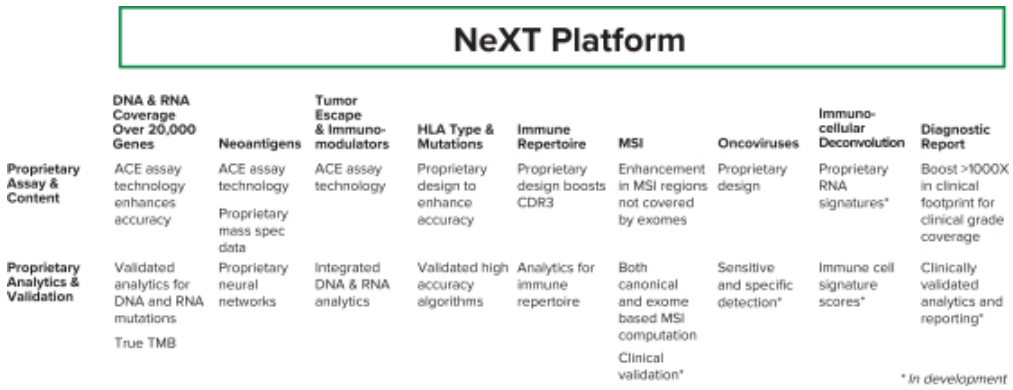
Since we offer a more comprehensive platform than others, we enable a broader analysis of key genomic biomarkers and signatures across multiple tumor and immune biomarker categories, such as neoantigens, HLA, immune modulator, DNA repair and replication, tumor-associated antigens, immune signatures, cytotoxicity, cytokines and chemokines, antigen processing machinery, and others (see Figure 10). Many of these biomarkers require both simultaneous assay and analytical technology development.

Figure 10. Broad biomarkers enabled by our platform give a comprehensive view of the biology.



In contrast to traditional approaches where assays are designed independently from the analytics, we have co-optimized our genomic assay design and analytics simultaneously to enable both unique analytical capabilities and enhanced performance for key biomarkers. Figure 11 summarizes some of the approaches we developed to achieve superior performance and comprehensiveness in our platform across a broad range of biomarkers:

Figure 11. Proprietary genomic assay and analytical innovations to enable NeXT.



	DNA & RNA Coverage Over 20,000 Genes	Neoantigens	Tumor Escape & Immuno-modulators	HLA Type & Mutations	Immune Repertoire	MSI	Oncoviruses	Immuno-cellular Deconvolution	Diagnostic Report
Proprietary Assay & Content	ACE assay technology enhances accuracy	ACE assay technology Proprietary mass spec data	ACE assay technology	Proprietary design to enhance accuracy	Proprietary design boosts CDR3	Enhancement in MSI regions not covered by exomes	Proprietary design	Proprietary RNA signatures*	Boost >1000X in clinical footprint for clinical grade coverage
Proprietary Analytics & Validation	Validated analytics for DNA and RNA mutations True TMB	Proprietary neural networks	Integrated DNA & RNA analytics	Validated high accuracy algorithms	Analytics for immune repertoire	Both canonical and exome based MSI computation Clinical validation*	Sensitive and specific detection*	Immune cell signature scores*	Clinically validated analytics and reporting*

* In development

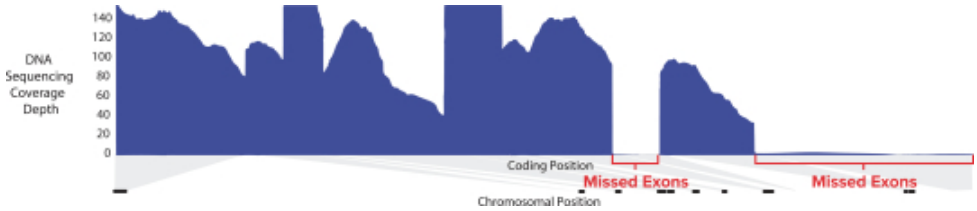
Superior Sequencing Quality and Coverage

Next generation sequencing ("NGS") is the technological basis for many tumor molecular profiling platforms today. NGS rapidly sequences nucleic acids and then uses a computationally intensive process to reconstruct gene sequences from millions of short sequence segments. These segments are processed in parallel, an approach that greatly increases the speed that the sequence data can be generated. However, because the segments come from random locations in the genome, reassembling the original sequence is both a technically

and computationally challenging process. A key objective is to ensure that every portion of the genes being sequenced is covered by at least one sequence segment. The average number of sequence segments representing a gene is referred to as the sequence depth. The deeper the coverage, the greater fraction of the gene is likely to be covered and the higher confidence that low-frequency variants can be found.

However, even when sequenced to high depth, typical NGS approaches can leave uneven, poor coverage in genes with mutations linked to cancer and cancer therapy. Many of these regions cannot be fully covered by simply sequencing to higher depth because their sequencing coverage deficits are due to inherent limitations of the NGS platform. Regions of high guanine-cytosine ("GC") content or repetitive sequence regions are two such examples of regions that are difficult to cover with standard NGS assays. This can leave gaps in coverage of therapeutically important genes (see Figure 12). This is particularly problematic in cancer, where there can be significant heterogeneity in the tumor samples that can make it even harder to see mutations in regions of poor coverage.

Figure 12. Coverage of SKT11 gene with standard NGS techniques leaves gaps in critical exonic regions.



To address the limitations of typical NGS-based assay, we have developed our patented Accuracy and Content Enhanced ("ACE") technology for next-generation sequencing. ACE improves nucleic acid preparation processes and combines it with patented assay and sequencing methods to achieve superior, high-fidelity, clinical-grade sequencing quality that ensures high sensitivity for mutations that can inform clinical and therapeutic applications such as neoantigen prediction, biomarker identification, and novel drug target selection.

Our NeXT Platform uses our ACE technology to provide coverage of difficult-to-sequence gene regions across all of the approximately 20,000 human genes, filling in key gaps left by other NGS approaches. ACE technology provides superior and uniform coverage of difficult genomic regions, such as high GC content areas, and fills gaps and inconsistencies in sequencing to achieve an optimal output (see Figure 13). ACE is able to deliver more comprehensive coverage not by simply generating more data, but by generating higher quality data. We and others have shown in two publications that our ACE technology achieves superior gene sequencing coverage and finishing (see Figure 14).

Figure 13. Coverage of SKT11 with our ACE sequencing process.

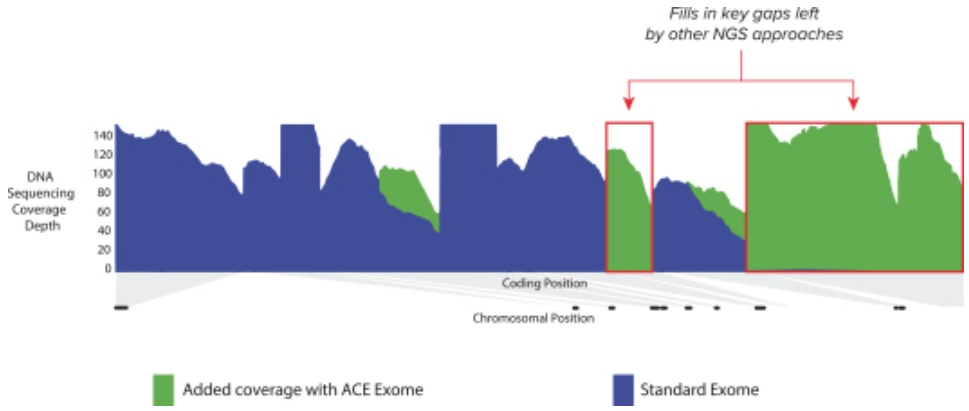
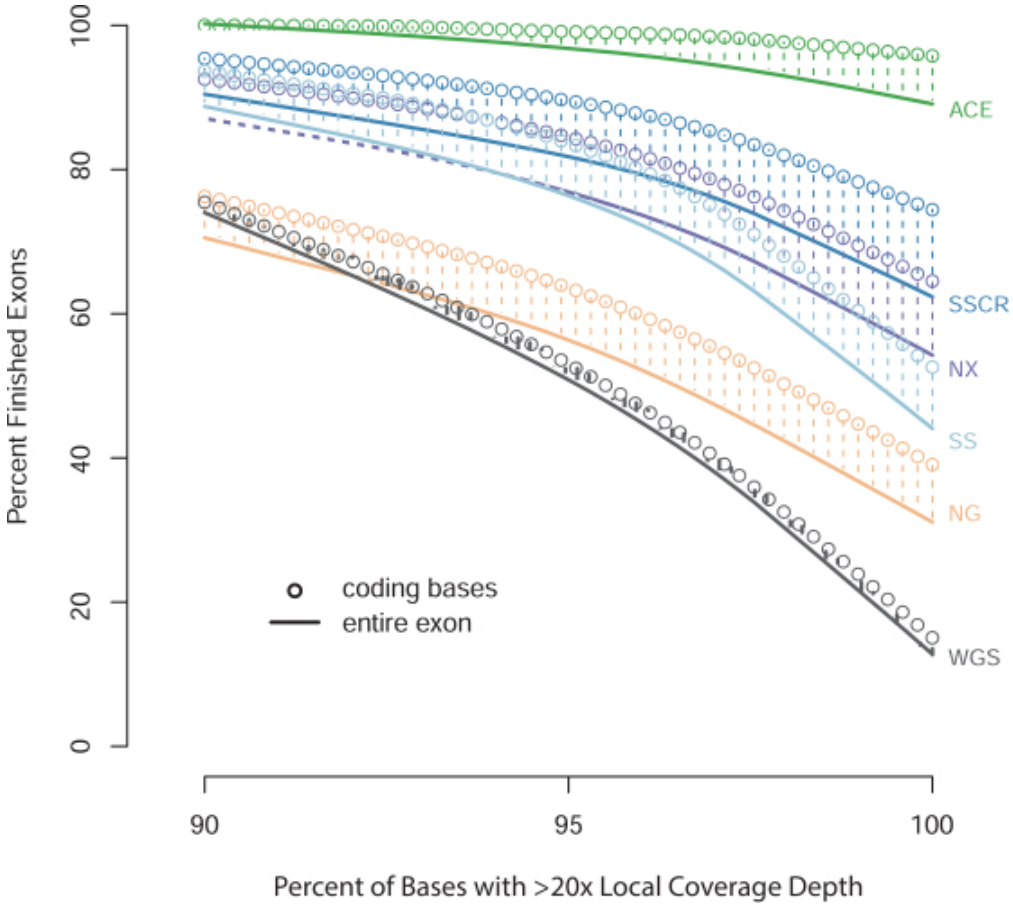


Figure 14. Personalis' ACE technology achieves superior sequencing coverage and gene finishing. (Patwardhan et al Genome Med. 2015)

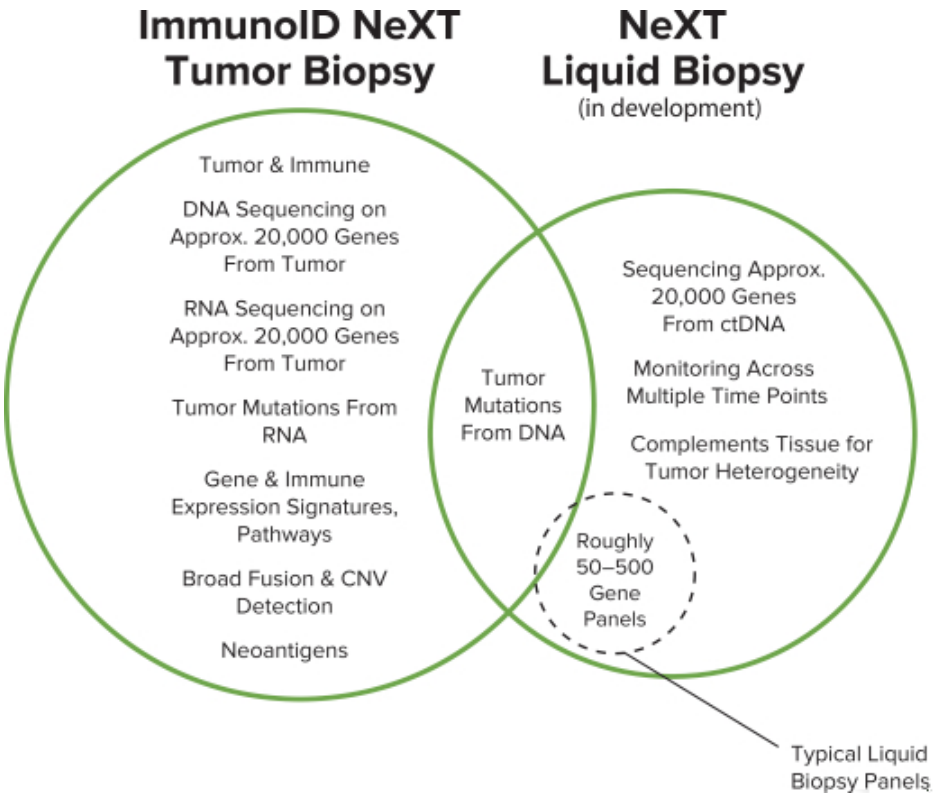


Liquid Biopsy Capabilities

Liquid biopsy approaches look at cfDNA in plasma samples derived from the blood. cfDNA is DNA that is released into circulation by cells, including tumor cells, as a result of cell death. This cfDNA can be obtained by a blood draw and can be used to monitor changes in tumor genetics.

We believe tumor biopsy and liquid biopsy approaches to tumor molecular profiling can provide complementary information for each patient. Tumor biopsies provide tumor immune microenvironment and tumor gene expression information that current liquid biopsy panels do not provide. Liquid biopsies can be useful for providing additional DNA mutation information, especially for monitoring therapy response across different time points when tumor biopsies are not feasible. Unlike typical liquid biopsy panel approaches focused on roughly 50 to 500 driver genes, we are designing our cfDNA approach, NeXT Liquid Biopsy, which is currently in development, to sequence all of the approximately 20,000 genes in the human genome. Our broader liquid biopsy approach will help biopharmaceutical customers identify biological changes across multiple time points for each patient in their trials that they would otherwise miss with the current, narrowly focused liquid biopsy panels. We also believe broader coverage will enable better neoantigen prediction, broader biomarker coverage, and higher potential to identify new drug targets.

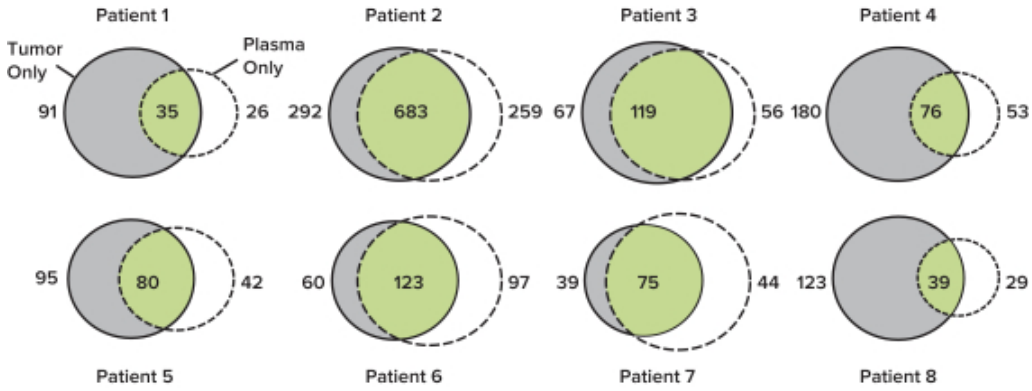
Figure 15: ImmunoID NeXT tumor biopsy and NeXT liquid biopsy (in development) yields complementary data.



We believe that combining tumor biopsies with cfDNA can provide a more complete picture of the spectrum of mutations found in a cancer patient. As an example of this, we compared the mutations found in eight late-stage colorectal tumor biopsy samples with those found in the plasma taken at the same time. We found a range of overlap between tumor biopsy-identified sequence variations and the sequences generated using

cfDNA. These observations show that, while there was significant overlap between the tumor and liquid biopsy results, there were also mutations unique to tumor biopsy and vice versa (see examples of this in Figure 16). This observation underscores the concept that tissue and liquid biopsies may be complementary, and when combined, may provide a more complete picture of the patient's disease.

Figure 16. Overlap of sequence variations detected in matched tumor and blood plasma.



Numbers indicate variants detected in the tumor only, plasma only, or in both.

We anticipate that our liquid biopsy approach will have many applications, including monitoring of tumor response to therapy over many time points, detecting new genetic variants from evolution of the tumor under therapeutic pressure, detecting acquired mechanisms of resistance, and identifying neoantigens.

NeXT makes comprehensive tumor molecular profiling practical for cancer patients at scale

To deliver a comprehensive immune-genomic assessment of a tumor, we invested substantial resources to engineer NeXT to provide data and analysis that would otherwise be unavailable or require many individual technologies, which collectively present significant costs and logistical impracticalities. With NeXT, we built a proprietary platform that is comprehensive, cost-effective, and scalable and enables a short turnaround time, making it practical to profile cancer patients at scale. This has required innovation on a number of fronts.

Comprehensive tumor and immune molecular profiling from a single limited tumor sample

The quality and quantity of tumor sample available for each patient is often very limited. We have developed proprietary techniques to overcome the challenges of working with these samples.

Tumor tissue biopsies, fine needle aspirates ("FNAs"), core biopsies, surgical resections, and blood specimens collected from cancer patients' samples are typically stored as fresh frozen ("FF") or formalin-fixed, paraffin-embedded ("FFPE") tissue. In both cases, there is typically limited tumor tissue available for molecular profiling. This can make it challenging, if not impossible, to achieve a comprehensive picture of the biology for each patient.

The quality of the tumor samples can also be a significant challenge. The best type of tumor sample for DNA and RNA sequencing and analysis is widely recognized to be FF biopsies. However, FF biopsies are not routinely collected because FFPE material is the specimen of choice for histopathological diagnosis. In almost every case, DNA extracted from FFPE specimens is degraded due to specimen processing, resulting in nucleic acid fragmentation, DNA crosslinks, random loss of nucleotide bases, localized DNA denaturation, strand breaks, and modification of bases leading to mutation artifacts which impede downstream sequencing analysis.

Conversely, FF samples are expensive to store and difficult to collect for large-scale studies. FFPE samples' quality issues exacerbate the issue of limited sample availability because when tissue is degraded, more of it is needed to generate sufficient sequencing data.

We have a simplified process using a dual simultaneous extraction of both DNA and RNA from challenging FFPE samples in a tissue-sparing manner. This allows us to use less tissue biopsy overall while preserving the quality of the extraction. When combined with our comprehensive assay, we are able to generate much more comprehensive data from a single limited sample than other platforms.

We have also developed techniques to overcome the challenges of working with difficult and degraded samples, including FFPE, FNAs, FF, PBMCs, and plasma. We are able to achieve high success rate with our customers. For prospectively collected FFPE samples with our personalized therapy partners, we achieve a greater than 95% success rate for obtaining high-quality data from tumor samples received from personalized cancer therapy customers due to our optimized nucleic acid extraction protocols.

Our proprietary software and operational infrastructure

We leverage Symphony, laboratory automation and protocols, and other technological improvements to power our NeXT Platform.

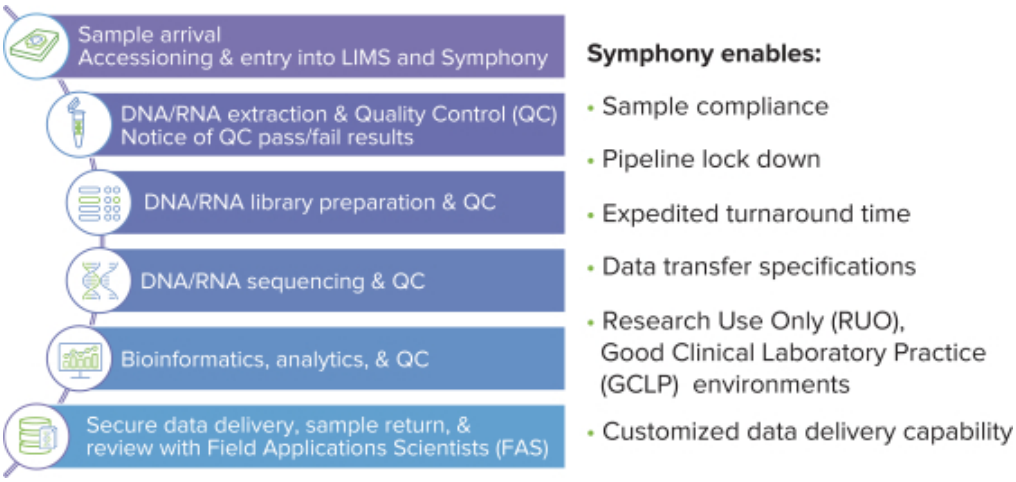
Symphony Enterprise Informatics Platform

Symphony is a flexible and scalable enterprise-grade system designed to manage the unique complexity and challenges of our large-scale genomics and analytics.

Symphony also integrates our LIMS and bioinformatics systems to connect laboratory operations with downstream data analysis. Symphony orchestrates all operational activities from the laboratory starting with sample receipt to the reporting of results of the tumor molecular profiling and data delivery. We developed Symphony to address the specific challenges associated with genomic data. Genomic data is unique in its size and complexity, even at the level of a single patient. The complexity is driven by data heterogeneity, such as DNA mutations, expression data, T-cell repertoire, and other sources, and the multifaceted workflows required to derive this data.

When scaled to the tens of thousands of samples per year, the complexity of genomic data grows and presents immense software engineering challenges. Since we did not identify any commercially available enterprise software system capable of addressing these challenges, we custom built Symphony from the ground up to address these specific challenges. In addition, Symphony manages multiple data and reporting streams with transparent versioning and traceability. This infrastructure allows us to meet the needs of all of our customers and provides a robust framework for future expansion as our customers anticipate clinical approval of their products.

Figure 17. Key customer benefits of Symphony.



Laboratory scale and automation

We have developed robust standard operating protocols and workflows that enable the accurate and efficient processing of samples from acquisition to data reporting. The combination of these standard protocols with dedicated staff and laboratory robotics has allowed us to develop an infrastructure that is designed to operate at scale. Our sequencing capacity has significantly increased each year since 2016, and we have an anticipated capacity of sequencing over 100,000 whole-genome length samples a year. Our high-performance computing infrastructure is capable of processing and storing the vast amount of data we generate with thousands of CPUs and petabytes of storage.

Enabling rapid turnaround time

Given the therapeutic and diagnostic applications of our platform, our customers require rapid turnaround times. The above technologies, which we have developed over years of engineering and optimization, allow us to achieve rapid turnaround times consistent with our customers' expectations, while also addressing the data complexity and achieving the level of comprehensiveness discussed above. For our personalized therapy partners, for example, we routinely deliver data and analytics in less than two weeks from sample receipt. Reductions in turnaround time have also required optimization of our laboratory processes. Our approach incorporates staffing of multiple shifts and over the weekends, so that each sample continues movement towards completion as rapidly as possible. We have purchased and installed highly parallel laboratory instruments, high-performance computing equipment, and multiple laboratory robots, developed laboratory workflow automation software, and invested in a significant multi-year research and development effort to integrate these pieces.

Delivering value to our customers

To deliver a comprehensive immuno-genomics assessment of a tumor, NeXT combines many elements that would previously have been individual assays, each with significant cost. These include a exome-scale sequencing assay that covers approximately 20,000 genes at high depth of sequence coverage, a transcriptome, a focused panel of cancer driver genes, a T-cell repertoire assay, a B-cell repertoire assay, an HLA typing assay, a microsatellite instability assay and several separate oncoviral assays. Although it has taken us several years to develop, optimize and validate, NeXT can now deliver all of these in a single platform, from a single sample. This is a major simplification of the testing process requiring fewer samples to be collected from each tumor. We offer NeXT at a cost that is competitive with tests that only address a single aspect of the spectrum of results NeXT delivers.

Breaking down the traditional separation between research and clinical platforms

Key parts of our platform have been analytically validated to support use in clinical trials, personalized therapies, and diagnostics.

We have actively differentiated our company and our services by building our ability to support our customers' regulatory filings, particularly with an eye toward personalized cancer therapeutics. In personalized cancer therapeutics, DNA sequencing and the associated data analysis are an integral part of each therapy and are a required element of the regulatory submission to obtain marketing approval. In addition to achieving CLIA licensing, CAP accreditation, and New York state certification for our laboratory over several years, starting in early 2017, we also began working with the FDA on filing a Device Master File. Our Device Master File is a document focused on the technology, quality management, and validation of our platform, specifically focused on its use for the development of personalized cancer therapies. This detailed information is not shared with our customers, but with our permission they can reference our FDA file number in their IND filings. We also provide support if the FDA has questions on our Device Master File. A growing number of clinical trials from a growing number of biopharmaceutical companies have been approved by the FDA that reference our Device Master File. To our knowledge, we are the only company with such a track record.

NeXT anticipates future cancer biomarkers that will be identified by rapidly evolving science

Existing narrow cancer panels can become outdated when new genetic biomarkers are identified. Given the rapid pace at which new cancer biomarkers and biology are being elucidated, this will continue to be a growing problem.

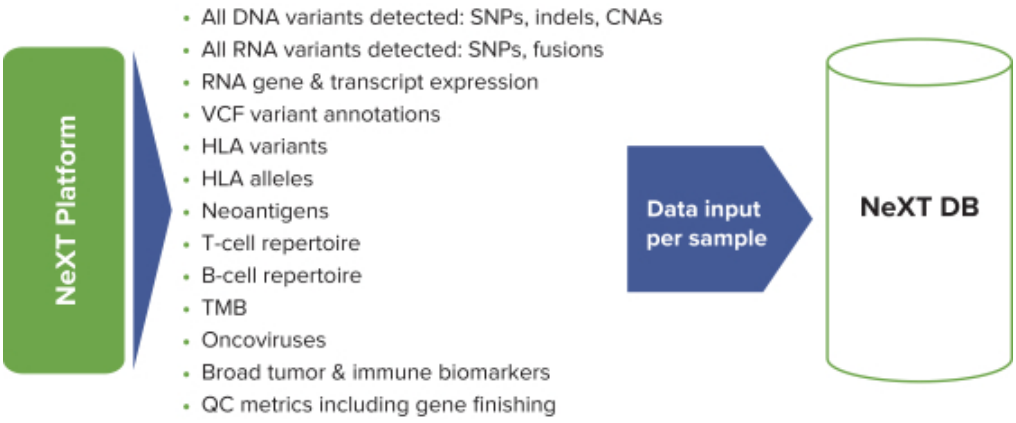
By covering all genes, DNA and RNA, tumor and normal tissue, tumor and immune biology, our platform can readily accommodate many of the new genetic biomarkers and signatures as they are published. This capability also allows the data generated from our platform to continue to yield new therapeutic insights even as our understanding of cancer and immune biology evolves. For example, just in the past few years, with immunotherapy, new tumor resistance biomarkers, such as HLA, JAK1/JAK2, B2M, and tumor mutational burden, and new gene expression signatures correlating with response have been published. By design, our platform already included these genes when the biomarkers were discovered.

NeXT generates comprehensive, harmonized data across patients to enable large-scale database creation and insight

As cancer therapy development becomes increasingly data driven, large databases aggregating information for many patients can be mined for new biomarkers and new potential therapeutic targets. By enabling comprehensive, harmonized data to be collected across large numbers of cancer patients, NeXT is setting the stage for new large-scale databases with unprecedented richness of tumor and immune data for each patient. Personalis is starting to build internal databases based on NeXT called NeXT DB (see Figure 18), as well as enabling our biopharmaceutical customers to build their own databases based on NeXT. With NeXT, we expect to solve many of the major challenges confronting biopharmaceutical companies trying to build these databases. In particular, our ability to solve the problem of data heterogeneity is important because it allows for more effective data mining and enables machine learning applications needed to analyze patient data within and across trials.

We also see a longer-term opportunity to enhance the value of a comprehensive tumor genomics database. This may include integration with other sources of RWD, such as electronic health records, which can generate RWE that may be used to reduce risk in early discovery by helping to identify biomarkers of response, improve trial execution through external control arms, expand indications for therapy, reduce trial size, and improve trial design. In December 2018, the FDA published a framework for evaluating RWD and RWE for use in regulatory decisions. This includes the potential use of RWD and RWE by biopharmaceutical companies to provide additional support for drug product effectiveness, serve as an external control for clinical trials, and provide data for observational studies.

Figure 18. Comprehensive genomic data for each sample can be structured and inputted into NeXT DB.



Our Platform Provides Value Across Many Therapeutic and Diagnostic Applications

We work closely with biopharmaceutical companies who are advancing new therapies in three major areas: immunotherapies, targeted therapies, and personalized cancer therapies. We have a critical role in generating new data and biological insights from patients in those clinical trials. We also see a long-term diagnostic opportunity for NeXT. Here, we describe some of the key products and applications of our platform.

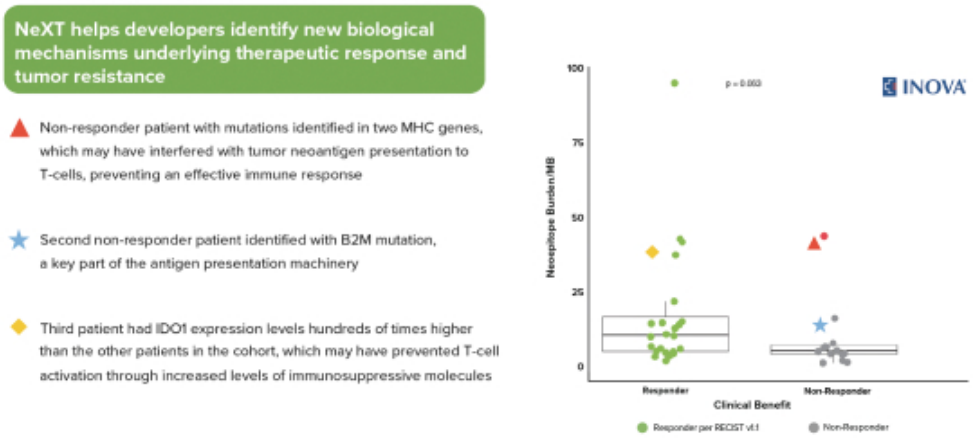
Cancer Immunotherapy Applications

Over the prior decade, a number of drugs have been approved by the FDA based on the discovery that the immune system plays a key role in fighting cancer. Checkpoint inhibitors, a specific type of immunotherapy, generated worldwide sales of over $16.6 billion in 2018, up from approximately $1.4 billion in 2014. Despite the medical and commercial success of these drugs showing the transformational potential of immunotherapy, the majority of patients do not respond to immune checkpoint inhibitors. The explosion in immunotherapy clinical trials across different immunotherapy modalities has also seen major challenges. The development of new therapies in this category is challenged by difficulties understanding the precise interaction between cancer and the immune system.

Our NeXT product is the newest version of our ImmunoID Platform aimed at immunotherapy development in translational research and clinical trials. NeXT enables immunotherapy translational and clinical researchers to comprehensively analyze both a tumor and its immune microenvironment from a single limited tissue sample. These samples are typically tumor tissue samples coming from patients enrolled in clinical trials. Our NeXT Platform can be used to investigate key areas of tumor biology, from elucidating mechanisms of tumor escape and detecting neoantigens, to identifying novel biomarker signatures and characterizing the immune repertoire. Since our platform provides comprehensive insights on tumor and immune biology, including in both innate and adaptive immune cells, we believe it will enable drug companies to identify biomarkers of response, mechanisms of resistance, and better understand how immunotherapies are working in patients.

Our collaboration with Inova Health System, a non-profit health organization based in Virginia, demonstrates how immunotherapy developers could use our platform to identify potential mechanisms of resistance. In this study, we applied our platform to generate profiles of the patients' tumors and to correlate those with the observed clinical responses. A cohort of the first 19 late-stage melanoma patients in this study were treated with anti-PD-1 checkpoint inhibitor immunotherapy. Consistent with prior research, the patients in our study with higher neoantigen burden were more likely to respond to checkpoint therapy, compared to those with lower neoantigen burden.

Figure 19. Neoantigen burden versus response to PD-1 checkpoint inhibitors in 19 late-stage melanoma patients and putative tumor escape mechanisms of outliers.



However, there were three outlier patients with high neoantigen burden whose response to checkpoint therapy was weaker than expected. Data from our platform helped provide putative mechanisms of tumor resistance. One patient had mutations in two MHC genes that may have caused this patient to be unable to properly present neoantigens found in the tumor to T-cells and thus prevented an effective immune response. A second non-responder patient had a mutation in the B2M gene which is a key part of the antigen presentation machinery. The third patient had expression levels of a gene called indoleamine 2,3-dioxygenase 1 ("IDO1") that were hundreds of times higher than the other patients in the cohort. The high levels of IDO1 in this patient may have therefore prevented T-cell activation through increased levels of these immunosuppressive molecules. This study highlights how this type of data can help immunotherapy developers identify new biological mechanisms that may be responsible for variable response to therapy.

We also believe our NeXT liquid biopsy (in development) has a strong application in biopharmaceutical clinical trials. With coverage of approximately 20,000 genes compared to smaller liquid biopsy panels focused on roughly 50 to 500 genes, we believe our liquid biopsy approach will allow our customers to see biological changes when monitoring tumor response to therapy.

Targeted Cancer Therapies Applications

Another growing category of successful cancer treatments consists of therapies that target specific genes or molecular mechanisms of cancer. These drugs are not designed to influence the immune system directly, but the success of immunotherapies has brought acknowledgment that the immune system has a significant effect on their efficacy. These therapies have grown to represent a considerable share of the overall oncology therapeutics market today. Much like for immunotherapy, our ImmunoID NeXT Platform helps targeted therapy developers better understand each patient's tumor and immune genomics more comprehensively, leading to insights that can help drive development of more successful therapies. We have customers developing solid tumor and hematological tumor-targeted therapies that are utilizing our platform as part of their drug development. We are positioning our company to be a leading provider of the detailed information that we believe will continue to drive targeted cancer therapy.

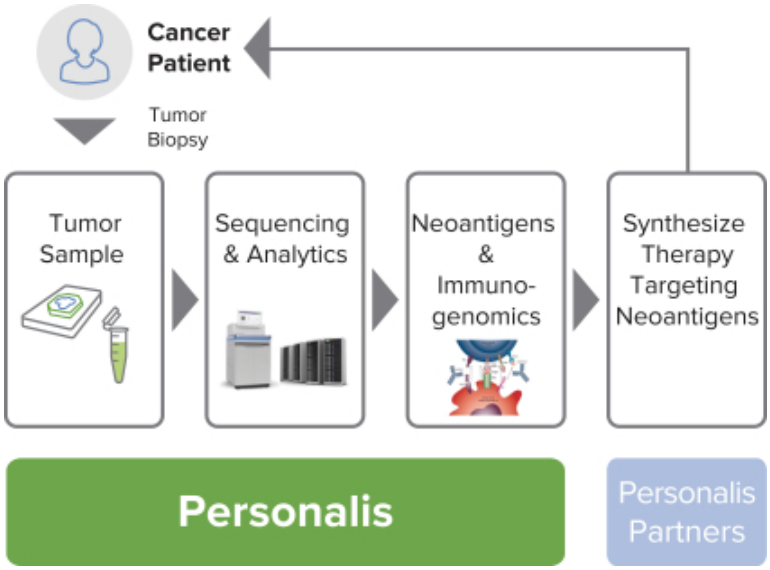
Personalized Cancer Therapy Applications

Many biopharmaceutical companies are pursuing personalized cancer therapies, which are designed and manufactured, individually, for each patient based on genomic alterations in a given patient's tumor. While there

are many potential approaches towards developing these therapies including neoantigen therapeutics, peptide-based vaccines, RNA and DNA vaccines, virally or bacterially encoded vaccines, and adoptive cell therapies, all of them benefit from the data and analytics that our platform can generate about a patient's tumor. Given the more than 700,000 cancer patients projected to be diagnosed with late-stage disease in the United States in 2019, we estimate that the total addressable market for our data and analytics for personalized cancer therapy could reach as much as $20 billion in the United States and as much as $40 billion worldwide. See the section titled "Market, Industry, and Other Data" for additional information regarding the data, sources, and assumptions we used for this estimate. Many of our customers have leveraged our FDA Device Master File as a component of their IND filings with the FDA. We anticipate that if drugs are approved whose design and clinical trials involved the use of our platform, we may be able to derive revenue in connection with the sale of these drugs, including the data generation and information processing required to treat each patient.

We believe we are working with the majority of companies developing neoantigen-targeted personalized cancer therapies. We work with companies developing both neoantigen-based personalized vaccines and personalized cell therapies for patients. Our platform serves as the genomics engine for many of these companies to generate comprehensive information required to identify potential neoantigens which can be used in personalized therapies. In addition, we generate other genomic information potentially useful in their therapy design process (see Figure 20).

Figure 20. Our platform is the genomics engine for the majority of personalized therapy companies today.



Our platform helps address key challenges for our personalized therapy partners:

- **The ability to identify more potential neoantigens.** With our platform, we use our proprietary technology to fill in sequencing gaps in genes so more neoantigens are detected. Furthermore we sequence approximately 20,000 genes to high depth in both DNA and RNA to increase sensitivity for mutations that can lead to neoantigens. We are also developing our NeXT liquid biopsy approach to identify additional and monitor existing neoantigens for personalized therapies.
- **The ability to better predict which putative neoantigens will trigger an immune response.** We have developed an analytical pipeline that helps identify putative neoantigens by synthesizing data from our platform. We also have developed proprietary mass spectrometry data and machine learning algorithms that improve accuracy of neoantigen-to-MHC binding prediction.

- **The ability to assess the MHC Class I and II HLA types for patients.** We have designed our assay specifically to augment HLA regions to enable high-accuracy HLA typing, a key input into the neoantigen prediction process for personalized therapies. This allows some of our customers to avoid separate HLA testing for each patient in their trial, simplifying logistics, and reducing turnaround time.
- **Broad characterization of other tumor immunogenomic modifiers that can impact patient response.** With our ImmungenomicsID report, we analyze both the DNA and RNA expression data for tumor and immune biomarkers that can inform the design of a personalized therapy.
- **High success rate on patient tumor samples.** With our proprietary methods and processes, we have been able to achieve a high success rate with samples from our personalized therapy customers. This is particularly critical for these clinical trials because if the tumor molecular profiling fails, these patients cannot receive the personalized therapy.
- **Rapid turnaround time.** The patients in clinical trials of these novel cancer therapeutics are often in the late-stages of disease. A therapy needs to be administered quickly to have the best chance of therapeutic benefit. This poses a challenge for personalized therapeutics. While a standard cancer therapy might be administered starting shortly after a patient is diagnosed, a personalized therapy will face a delay. This is the time required to obtain a sample from a patient, analyze the genetics of that individual tumor, and design, manufacture, and perform quality control on the therapy. Getting comprehensive tumor molecular profiling data from our platform is a key component of the overall time to personalized therapeutic delivery. With technology innovation, laboratory automation, and operational optimization, we have been able to achieve rapid turnaround time for our partners of less than two weeks in most cases, and for some in as few as seven days. Our ability to achieve rapid turnaround provides a large benefit to customers in this area.
- **Proactive approach with the FDA.** Because the area of personalized therapy is still being defined from a regulatory standpoint, we have taken a proactive approach to working with the FDA. To enable our partners in this space, we have filed a Device Master File with the FDA that our customers can refer to in their IND submissions. This document details the technology underlying our platform as well as the validation that has been performed.

Diagnostic Applications

Over time, we also expect to work with our biopharmaceutical customers and research collaborators to build evidence of clinical utility for our platform as a diagnostic for advanced cancer therapies. We see a growing long-term diagnostic opportunity for NeXT as a one-stop, universal tumor molecular profiling test for cancer patients covering all of the approximately 20,000 human genes compared to the roughly 50 to 500 genes covered by many currently marketed panels. We are planning to release a diagnostic based on our NeXT Platform that we envision being used with biopharmaceutical and clinical partners. This product analyzes FFPE tumor samples with our NeXT Platform and returns a CLIA diagnostic report for physicians that details the therapeutic options for patient-based on the tumor mutations identified from our analysis of the sample. We also see this product as one that will help us build our internal NeXT database over time. We estimate that the total addressable market in the United States and the European Union for oncology clinical diagnostic testing was $14.4 billion in 2018. See the section titled “Market, Industry, and Other Data” for additional information regarding the data, sources, and assumptions we used for this estimate.

Commercialization Strategy

We commercialize our products in the United States and Europe through our targeted sales organization. In 2018, we derived substantially all of our revenues from our customers in the United States. Our sales representatives have extensive experience in enterprise/consultative selling in the genomics space. We augment this team with Ph.D.-level Field Application Specialists that provide deep understanding and expertise in the areas of oncology and genomics applications, ensuring top-quality pre- and post-sales customer support. Our

commercial efforts are focused on demonstrating the value proposition of the NeXT Platform to biopharmaceutical customers with the goal of both increasing utilization of the product at existing accounts and to drive adoption in new targeted accounts. Our entire commercial organization promotes our ability to support biopharmaceutical customers across several application areas including biomarker discovery, new target discovery, therapy development, and treatment monitoring.

We anticipate that patients in clinical trials for cancer therapies will increasingly be tested pre-treatment and periodically afterwards to understand response to treatment in deep molecular detail, as their tumors evolve under therapeutic pressure. Although the majority of our revenues come from single time point testing, we believe our revenues from multiple time point testing will continue to grow. We also derive revenues from analysis of multiple customer samples from the same patient and time point to assess genetic differences between the primary tumor and metastases. Given the value of comprehensive genomic information from multiple time points or samples, we anticipate that our revenue, and the available market, will continue to grow.

As the clinical utility of advanced biomarkers is further established, we expect there to be a patient-centered diagnostic opportunity whereby some patients would be guided to personalized therapies. We believe that our platform's ability to support biomarkers for a broad range of therapeutics positions us to be a leader in therapy selection for patients. We are currently developing this diagnostic and we anticipate launch, initially for use in biopharmaceutical clinical trials, in 2019.

Material Agreements

VA MVP Agreement

On September 28, 2017, we entered into a contract with the VA for the VA MVP to provide them with a combination of whole genome sequencing services (the "VA MVP Agreement"). The performance period for the services includes a base period of one year (September 2017 to August 2018), with three one-year renewal option periods that may be exercised upon discretion of the VA MVP (September 2018 to August 2019; September 2019 to August 2020; and September 2020 to August 2021). Each task order issued against the VA MVP Agreement has a separate period of performance and is subject to the terms and conditions of the VA MVP Agreement. Funds are obligated by the VA MVP under each task order based on actual needs.

All materials and samples utilized during the course of the VA MVP Agreement and all data first produced or delivered under the VA MVP Agreement are the sole property of the VA MVP. Under the VA MVP Agreement, we are subject to confidentiality and security obligations, as well as various obligations upon events of default.

The VA MVP may terminate the VA MVP Agreement, or any part thereof, at its sole convenience. Subject to the terms of the VA MVP Agreement, we shall be paid a percentage of the contract price reflecting the percentage of the work performed prior to the notice of termination, plus reasonable charges that we can demonstrate have resulted from the termination.

The VA MVP may terminate the VA MVP Agreement, or any part thereof, for cause in the event of any default by us, or if we fail to comply with any contract terms and conditions, or fail to provide the VA MVP, upon request, with adequate assurances of future performance. In the event of termination for cause, the VA MVP shall not be liable to us for any amount for supplies or services not accepted, and we shall be liable to the VA MVP for any and all rights and remedies provided by law. If it is determined that the VA MVP improperly terminated this contract for default, such termination shall be deemed a termination for convenience.

Agreements with Illumina

On March 21, 2017 we received a quotation for supply of genetic analysis products (the "Quote") from Illumina. The Quote provided information as to the cost of five Illumina® Product Care NovaSeq®6000

Comprehensive Plans and five NovaSeq™6000 Sequencing System instruments. The term of the Quote extended through March 31, 2017. On March 31, 2017, we submitted a purchase order to Illumina for five NovaSeq™6000 Sequencing System instruments, all of which we have received. On March 1, 2019, we received another quotation for supply of genetic analysis products (the "Second Quote") from Illumina. The Second Quote provided information as to the cost of five NovaSeq™6000 Sequencing System instruments. The term of the Second Quote extended through March 31, 2019. On March 20, 2019, we submitted a purchase order to Illumina for five NovaSeq™6000 Sequencing System instruments, one of which we have received and four of which will be received on or before the due date of March 23, 2023.

On November 1, 2017, we entered into a master services subcontract agreement (the "Subcontract Agreement") with Illumina. Under the terms of the Subcontract Agreement, we engaged Illumina as our subcontractor to perform certain genotyping services (the "Services") on our behalf pursuant to written purchase orders in fulfillment of our VA MVP Agreement. The price for Illumina's Services set forth in the Subcontract Agreement is effective through December 31, 2021, or later if the VA MVP Agreement is extended.

The Subcontract Agreement extends through the last day of the VA MVP Agreement, currently August 2021 but as may be extended, unless it is otherwise terminated early pursuant to its terms. All or part of the Subcontract Agreement may be terminated at our convenience in the event that the VA MVP terminates the VA MVP Agreement or terminates the part of the VA MVP Agreement that affects the Services provided by Illumina. Each party may terminate the Subcontract Agreement for default in the event that the other party materially fails to perform any of the provisions of the Subcontract Agreement, materially fails to make progress so as to endanger performance of the Subcontract Agreement in accordance with its terms, or becomes financially or legally incapable of completing the work and does not provide a plan of correction or recovery within the provided period of time to cure such failure. The Subcontract Agreement may be renewed for subsequent one-year terms as agreed by the parties subject to a four-year limit.

On November 22, 2017, we entered into a pricing agreement with Illumina. The pricing agreement provided pricing terms for the NovaSeq™ 5000/6000 S4 Reagent Kit (each, a "Kit"). On March 26, 2019, we entered into a new pricing agreement with Illumina, which replaced in its entirety the agreement dated November 22, 2017. The new pricing agreement has a purchase commitment of $1.7 million by June 30, 2019 to purchase these Kits. The term of the pricing agreement extends through December 31, 2022.

On December 13, 2017, we received a Fast Track genetic analysis services agreement (the "Services Agreement") from Illumina that provides pricing information for the Infinium Global Screening Array V2.0 Fast Track Service. The term of the Services Agreement extends through June 30, 2019.

On February 22, 2019 we received a quotation for supply of genetic analysis products (the "Master Quote") from Illumina that provides for additional pricing terms on Illumina products. The term of the Master Quote extends through February 14, 2020.

Competition

We provide a comprehensive, exome-scale analysis of both a tumor and its microenvironment, including the immune cells, from a single tissue sample.

Our primary competition comes from companies offering genomic profiling services for either the tumor or the immune microenvironment. These companies offer services that implement various technological approaches including next-generation sequencing and microarray analyses. These competitors include Guardant Health, Inc., Foundation Medicine, Inc., which was acquired by Roche Holdings, Inc. in July 2018, Roche Molecular Systems, Inc., NanoString Technologies, Inc., Personal Genome Diagnostics, Inc., and Adaptive Biotechnologies Corporation.

Competitors within the broader genomics profiling space include laboratory companies such as Laboratory Corporation of America Holdings, Quest Diagnostics, Inc., Caris Life Sciences, Inc., Myriad Genetics, Inc., Tempus, Inc., InVitae Corp., BGI Group, Macrogen, Inc., Natera, Inc., Illumina, Thermo Fisher Scientific Inc., NeoGenomics, Inc., and MedGenome Inc. Additionally, several companies develop next-generation sequencing platforms that can be used for genomic profiling for biopharmaceutical research and development applications. These include Illumina, Thermo Fisher Scientific Inc., and other organizations that specialize in the development of next-generation sequencing instrumentation that can be sold directly to biopharmaceutical companies, clinical laboratories, and research centers. Separate from their instrumentation product lines, both Illumina and Thermo Fisher Scientific Inc., for example, currently market next-generation sequencing clinical oncology kits that are sold to customers who have bought and operate their respective sequencing instruments.

We believe that we compete favorably because of the integrity and comprehensiveness of the data generated by our NeXT Platform. Maximizing insights into both the tumor- and immune-related components of the tumor microenvironment is essential in identifying and understanding the reasons why certain cancer patients respond more favorably to oncology therapies than others. It is via access to such a comprehensive dataset for each patient that our customers can begin to discover new, clinically relevant biomarkers for the immunotherapy era, and ultimately improve cancer patient outcomes with the development of more efficacious therapeutics.

Intellectual Property

Protection of our intellectual property is fundamental to the long-term success of our business. Specifically, our success is dependent on our ability to obtain and maintain proprietary protection for our technology and the know-how related to our business, defend and enforce our intellectual property rights, and operate our business without infringing, misappropriating, or otherwise violating valid and enforceable intellectual property rights of others. We seek to protect our investments made into the development of our technology by relying on a combination of patents, trademarks, copyrights, trade secrets, know-how, confidentiality agreements and procedures, non-disclosure agreements with third parties, employee disclosure and invention assignment agreements, and other contractual rights.

Our patent strategy is focused on seeking coverage for our core technology, our ACE assay, and specific follow-on applications and implementations for enhancing sequencing coverage of certain genomic regions and analyzing cell-free nucleic acids. In addition, we file for patent protection on our ongoing research and development, particularly other novel assay technologies which may be applicable in cancer cases and other diseases.

Notwithstanding these efforts, we cannot be sure that patents will be granted with respect to any patent applications we have filed or may license or file in the future, and we cannot be sure that any patents we have or may be licensed or granted to us in the future, will not be challenged, invalidated, or circumvented, or that such patents will be commercially useful in protecting our technology. Moreover, we rely, in part, on trade secrets to protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection. However, trade secrets can be difficult to protect. While we take steps to protect and preserve our trade secrets, including by entering into confidentiality agreements with our employees, consultants, scientific advisors, and contractors, and maintaining physical security of our premises and physical and electronic security of our information technology systems, such measures can be breached, and we may not have adequate remedies for any such breach. In addition, our trade secrets may otherwise become known or be independently discovered by competitors. For more information regarding the risks related to our intellectual property, please see “Risk Factors—Risks Related to Our Intellectual Property.”

Our patent portfolio is comprised of patents and patent applications owned by the company. These patents and patent applications generally fall into four broad categories:

- our ACE assay technology, including claims directed to methods for enriching sample nucleic acids based on differences in GC-content, molecular size, presence of genetic variations or rearrangements, epigenetic modifications, and species-origin (e.g., human and non-human);

- hybrid exome-genome technologies, including claims directed to methods for combining exome and genome sequencing data generated from a sample to identify polymorphisms;
- liquid biopsy methods, including claims directed to methods of analyzing sequenced cell-free and leukocyte-derived nucleic acids in a blood sample to identify a tissue source, or recommend a drug treatment; and
- clinical interpretation methods, including claims directed to methods of ranking genes associated with a phenotype and inheritance pattern.

As of May 9, 2019, we own ten issued U.S. and foreign patents in China and the United Kingdom and several pending U.S. and foreign patent applications. Issued U.S. patents in our portfolio of company-owned patents and patent applications are expected to expire between 2033 and 2035, excluding any additional term for patent term adjustments or patent term extensions.

Government Regulations

Federal and State Laboratory Licensing Requirements

Under the Clinical Laboratory Improvement Amendments of 1988 ("CLIA"), a laboratory is any facility that performs laboratory 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. CLIA requires that a laboratory hold a certificate applicable to the type of laboratory examinations it performs and that it complies with, among other things, standards covering operations, personnel, facilities administration, quality systems and proficiency testing, which are intended to ensure, among other things, that clinical laboratory testing services are accurate, reliable and timely.

To renew our CLIA certificate, we are subject to survey and inspection every two years to assess compliance with program standards. Because we are a College of American Pathologists ("CAP") accredited laboratory, the Centers for Medicare & Medicaid Services ("CMS") does not perform this survey and inspection and relies on our CAP survey and inspection. We also 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, a laboratory that is certified as "high complexity" under CLIA may develop, manufacture, validate, and use proprietary tests referred to as laboratory developed tests ("LDTs"). CLIA requires analytical validation including accuracy, precision, specificity, sensitivity, and establishment of a reference range for any LDT used in clinical testing. The regulatory and compliance standards applicable to the testing we perform may change over time, and any such changes could have a material effect on our business.

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. State laws may require that nonresident laboratories, or out-of-state laboratories, maintain an in-state laboratory license to perform tests on samples from patients who reside in that state. As a condition of state licensure, these state laws may require that laboratory personnel meet certain qualifications, specify certain quality control procedures or facility requirements, or prescribe record maintenance requirements. Because our laboratory is located in the state of California, we are required to and do maintain a California state laboratory license. We also maintain licenses to conduct testing in other states where nonresident laboratories are required to obtain state laboratory licenses. We maintain a current license with the New York State Department of Health for our laboratory. Other states may currently have or adopt similar licensure requirements in the future, which may require us to modify, delay, or stop its operations in those states.

Failure to comply with CLIA certification and state clinical laboratory licensure requirements may result in a range of enforcement actions, including certificate or license suspension, limitation, or revocation, directed plan

of action, onsite monitoring, civil monetary penalties, criminal sanctions, and revocation of the laboratory's approval to receive Medicare and Medicaid payment for its services, as well as significant adverse publicity.

Regulatory framework for medical devices in the United States

Pursuant to its authority under the Federal Food, Drug and Cosmetic Act (the "FDC Act"), the FDA has jurisdiction over medical devices, which are defined to include, among other things, in vitro diagnostic devices ("IVDs"). The FDA regulates, among other things, the research, design, development, pre-clinical and clinical testing, manufacturing, safety, effectiveness, packaging, labeling, storage, recordkeeping, pre-market clearance or approval, adverse event reporting, marketing, promotion, sales, distribution, and import and export of medical devices. Unless an exemption applies, each new or significantly modified medical device we seek to commercially distribute in the United States will require either a premarket notification to the FDA requesting permission for commercial distribution under Section 510(k) of the FDC Act, also referred to as a 510(k) clearance, or approval from the FDA of a PMA. Both the 510(k) clearance and PMA processes can be resource intensive, expensive, and lengthy, and require payment of significant user fees.

FDA Regulation of Laboratory Developed Tests

Although the FDA regulates medical devices, including IVDs, the FDA has historically exercised its enforcement discretion and not enforced applicable provisions of the FDC Act and FDA regulations with respect to LDTs, which are a subset of IVDs that are intended for clinical use and developed, validated, and offered within a single laboratory for use only in that laboratory. We currently intend to market a diagnostic test based on the NeXT Platform as an LDT. As a result, we believe our diagnostic services are not currently subject to the FDA's enforcement of its medical device regulations and the applicable FDC Act provisions.

Legislative and administrative proposals addressing oversight of LDTs were introduced in recent years and we expect that new legislative and administrative proposals will be introduced from time to time. It is possible that legislation could be enacted into law or regulations or guidance could be issued by the FDA, which may result in new or increased regulatory requirements for us to continue to offer our LDTs or to develop and introduce new tests as LDTs. For example, in 2014 the FDA issued two draft guidance documents proposing a risk-based framework with respect to applying the FDA's oversight over LDTs. The framework guidance stated 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. Thus, the FDA planned to begin to enforce its medical device requirements, including premarket submission requirements, on LDTs that have historically been marketed without FDA premarket review and oversight. In November 2016, the FDA announced its intention not to finalize the 2014 draft guidance 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. In January 2017, the FDA issued a discussion paper on possible approaches to the regulation of LDTs.

Federal and State Fraud and Abuse Laws

We are subject to federal fraud and abuse laws such as the federal Anti-Kickback Statute (the "AKS"), the federal prohibition against physician self-referral (the "Stark Law"), and the federal false claims law, or the False Claims Act (the "FCA"). We are also subject to similar state and foreign fraud and abuse laws.

The AKS prohibits, among other things, knowingly and willfully offering, paying, soliciting, or receiving remuneration, directly or indirectly, overtly or covertly, in cash or in kind, in return for or to induce such person to refer an individual, or to purchase, lease, order, arrange for, or recommend purchasing, leasing, or ordering, any good, facility, item, or service that is reimbursable, in whole or in part, under a federal healthcare program.

The Stark Law and similar state laws, including California's Physician Ownership and Referral Act, generally prohibit, among other things, clinical laboratories and other entities from billing a patient or any

governmental or commercial payer for any diagnostic services when the physician ordering the service, or any member of such physician's immediate family, has a direct or indirect investment interest in or compensation arrangement with us, unless the arrangement meets an exception to the prohibition.

Other federal fraud and abuse laws to which we are subject include, but are not limited to, the federal civil and criminal false claims laws including the FCA, which 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 to the federal government, and the federal Civil Monetary Penalties Law, which prohibits, among other things, the offering or transfer of remuneration to a Medicare or state healthcare program beneficiary if the person knows or should know it is likely to influence the beneficiary's selection of a particular provider, practitioner, or supplier of services reimbursable by Medicare or a state healthcare program, unless an exception applies. Under the FCA, private citizens can bring claims on behalf of the government through qui tam actions. We must also operate within the bounds of the fraud and abuse laws of the states in which we do business which may apply to items or services reimbursed by non-governmental third-party payers, including private insurers.

Efforts to ensure that our business arrangements with third parties will comply with applicable healthcare laws and regulations will involve substantial costs. If our operations are found to be in violation of any of these laws or any other governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, fines, imprisonment, exclusion from government-funded healthcare programs, such as Medicare and Medicaid, disgorgement, contractual damages, reputational harm, diminished profits and future earnings, additional reporting, or oversight obligations if we become subject to a corporate integrity agreement or other agreement to resolve allegations of non-compliance with the law and the curtailment or restructuring of our operations. If any of the physicians or other healthcare providers or entities with whom we do business is found to be not in compliance with applicable laws, they may be subject to significant criminal, civil or administrative sanctions, including exclusions from government-funded healthcare programs.

HIPAA and HITECH

Under the administrative simplification provisions of the Health Insurance Portability and Accountability Act of 1996 ("HIPAA"), as amended by the Health Information Technology for Economic and Clinical Health Act "HITECH"), the U.S. Department of Health and Human Services ("HHS") issued regulations that establish uniform standards governing the conduct of certain electronic healthcare transactions and requirements for protecting the privacy and security of protected health information ("PHI"), used or disclosed by covered entities and business associates. Covered entities and business associates are subject to HIPAA and HITECH. Our subcontractors that create, receive, maintain, transmit, or otherwise process PHI on behalf of us are HIPAA "business associates" and must also comply with HIPAA as a business associate.

HIPAA and HITECH include privacy and security rules, breach notification requirements, and electronic transaction standards.

The Privacy Rule covers the use and disclosure of PHI by covered entities and business associates. The Privacy Rule generally prohibits the use or disclosure of PHI, except as permitted under the Rule. The Privacy Rule also sets forth individual patient rights, such as the right to access or amend certain records containing his or her PHI, or to request restrictions on the use or disclosure of his or her PHI.

The Security Rule requires covered entities and business associates to safeguard the confidentiality, integrity, and availability of electronically transmitted or stored PHI by implementing administrative, physical, and technical safeguards. Under HITECH's Breach Notification Rule, a covered entity must notify individuals, the Secretary of the HHS, and in some circumstances, the media of breaches of unsecured PHI.

In addition, we may be subject to state health information privacy and data breach notification laws, which may govern the collection, use, disclosure, and protection of health-related and other personal information.

California, for example, has enacted the Confidentiality of Medical Information Act, which sets forth standards in addition to HIPAA and HITECH with which all California health care providers like us must abide. State laws may be more stringent, broader in scope, or offer greater individual rights with respect to PHI than HIPAA, and state laws may differ from each other, which may complicate compliance efforts.

Entities that are found to be in violation of HIPAA as the result of a failure to secure PHI, a complaint about our privacy practices or an audit by HHS, may be subject to significant civil and criminal fines and penalties and additional reporting and oversight obligations if such entities are required to enter into a resolution agreement and corrective action plan with HHS to settle allegations of HIPAA non-compliance.

U.S. Healthcare Reform

In the United States, there have been a number of legislative and regulatory changes at the federal and state levels that seek to reduce healthcare costs and improve the quality of healthcare. For example, in March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act (collectively, the "ACA"), became law. This law substantially changed the way health care is financed by both commercial payers and government payers, and significantly impacted our industry. The ACA contained a number of provisions expected to impact the clinical laboratory industry, such as changes governing enrollment in state and federal health care programs, reimbursement changes, and fraud and abuse.

Some of the provisions of the ACA have yet to be implemented, and there have been judicial and Congressional challenges to certain aspects of the ACA, as well as recent efforts by the Trump administration to repeal or replace certain aspects of the ACA. Since January 2017, President Trump has signed two executive orders and other directives designed to delay the implementation of certain provisions of the ACA. Concurrently, Congress has considered legislation that would repeal or repeal and replace all or part of the ACA. While Congress has not passed comprehensive repeal legislation, it has enacted laws that modify certain provisions of the ACA such as removing penalties, starting January 1, 2019, for not complying with the ACA's individual mandate to carry health insurance and delaying the implementation of certain ACA-mandated fees. On December 14, 2018, a Texas U.S. District Court Judge ruled that the ACA is unconstitutional in its entirety because the "individual mandate" was repealed by Congress as part of the Tax Cuts and Jobs Act of 2017. While the Texas U.S. District Court Judge, as well as the Trump administration and CMS, have stated that the ruling will have no immediate effect pending appeal of the decision, it is unclear how this decision, subsequent appeals, and other efforts to repeal and replace the ACA will impact the ACA.

We anticipate there will continue to be proposals by legislators at both the federal and state levels, regulators and commercial payers to reduce costs while expanding individual healthcare benefits. Certain of these changes could impose additional limitations on the prices we will be able to charge for our tests, the coverage of or the amounts of reimbursement available for our tests from payers, including commercial payers and government payers.

Our Employees

As of March 31, 2019, we had 147 full-time employees, with 64 in research and development, 47 in laboratory operations, 19 in commercial operations and 17 in general and administrative functions. Of these full-time employees, 144 are located in the United States (including 135 who work at our corporate headquarters in Menlo Park, California and 9 who work remotely) and three are located in the United Kingdom and Germany. As of March 31, 2019, more than 60 of our full-time employees had completed a Ph.D. or other advanced science or medical degree.

None of our employees is represented by a labor union or covered by collective bargaining agreements, and we have not experienced any work stoppages. We consider our relations with our employees to be good.

Our Facilities

Our corporate headquarters are located in Menlo Park, California, and comprise approximately 31,280 square feet of space, pursuant to an operating lease that expires in 2020. This lease includes an option to extend for an additional three years, at market rates that prevail at the time of our election to extend. Our CLIA-certified laboratory is located in this facility.

We believe that this facility is sufficient to meet our current needs. We also believe we will be able to obtain additional space, as needed, on commercially reasonable terms.

Legal Proceedings

From time to time, we are involved in various legal proceedings arising from the normal course of business activities. We are not presently a party to any litigation the outcome of which, we believe, if determined adversely to us, would individually or taken together have a material adverse effect on our business, operating results, cash flows, or financial condition. Defending such proceedings is costly and can impose a significant burden on management and employees, we may receive unfavorable preliminary or interim rulings in the course of litigation, and there can be no assurances that favorable final outcomes will be obtained.

MANAGEMENT

The following table sets forth information for our executive officers and directors as of March 31, 2019:

Name	Age	Position
Executive Officers		
John West	62	President, Chief Executive Officer and Director
Richard Chen, M.D., M.S.	48	Chief Scientific Officer
Clinton Musil	38	Chief Business Officer
Aaron Tachibana	58	Chief Financial Officer
Non-Employee Directors		
Patrick Balthrop(2)(3)	62	Director
A. Blaine Bowman(1)	72	Director
Alan Colowick, M.D.(3)	56	Director
Kenneth Ludlum(1)	65	Director
Jonathan MacQuitty, Ph.D.(2)	66	Chairman of the Board
Paul Ricci(1)(2)	62	Director

(1) Member of the audit committee.
(2) Member of the compensation committee.
(3) Member of the nominating and corporate governance committee.

Executive Officers

John West. Mr. West is one of our founders and has served as Chief Executive Officer and as a member of our board of directors since August 2011. From May 2009 to July 2011, Mr. West served as Chief Executive Officer of ViaCyte, Inc., a regenerative medicine company. From August 2004 to January 2008, Mr. West served in various roles, including Chief Executive Officer from August 2004 to March 2005 at Solexa, Ltd., a DNA sequencing company, which became Solexa, Inc., Chief Executive Officer from March 2005 to January 2007 at Solexa, Inc., and Senior Vice President of DNA Sequencing from January 2007 to January 2008 at Illumina, Inc., a biotechnology company, after the sale of Solexa, Inc. to Illumina, Inc. Mr. West's earlier career included positions related to DNA sequencing automation. Mr. West holds a B.S. in Nuclear Engineering and an M.S. in Mechanical Engineering from Massachusetts Institute of Technology and an M.B.A. from the Wharton School at the University of Pennsylvania. Mr. West was selected to serve on our board of directors because of the perspective and experience he brings as our Chief Executive Officer and his operating and management experience in the healthcare technology industry, particularly related to DNA sequencing and its applications.

Richard Chen, M.D., M.S. Dr. Chen has served as our Chief Scientific Officer since November 2011. Since September 2011, Dr. Chen has served on the clinical faculty at Stanford University School of Medicine. In August 1997, Dr. Chen co-founded Ingenuity Systems, a genomic data software company. Dr. Chen holds a B.S. in Computer Science from Stanford University, an M.S. in Medical Informatics from Stanford University School of Medicine, and an M.D. from Stanford University School of Medicine.

Clinton Musil. Mr. Musil has served as our Chief Business Officer since December 2018. From September 2017 to July 2018, Mr. Musil served as Vice President, Corporate Development at ARMO Biosciences, an immuno-oncology company that was acquired by Eli Lilly and Company. From July 2017 to September 2017, Mr. Musil served as a Managing Director at Hercules Capital, an investment firm. From September 2014 to March 2017, Mr. Musil served as a Vice President in the Healthcare Investment Banking Group at Deutsche Bank AG, an investment bank. From July 2013 to July 2014, Mr. Musil served as a Vice President in the

Healthcare Investment Banking Group at Wells Fargo & Company, an investment bank. Earlier in his career, Mr. Musil was an investor at Essex Woodlands, a healthcare-focused investment fund. Mr. Musil holds a B.S. in Molecular and Cellular Biology from the University of Arizona and an M.B.A. from Harvard Business School.

Aaron Tachibana. Mr. Tachibana has served as our Chief Financial Officer since March 2019. From August 2015 to September 2018, Mr. Tachibana served as Chief Financial Officer at Lumentum Holdings Inc., a designer and manufacturer of optical and photonic products. From November 2013 to July 2015, Mr. Tachibana served as Vice President, Finance and Corporate Controller at JDS Uniphase Corp., subsequently renamed Viavi Solutions Inc., a network test, measurement, and assurance technology company. From March 2010 to October 2013, Mr. Tachibana served as Chief Financial Officer at Pericom Semiconductor Corp., a supplier of high-performance connectivity and timing solutions. Mr. Tachibana holds a B.S. in Business Administration and Finance from San Jose State University.

Non-Employee Directors

***Patrick Balthrop*.** Mr. Balthrop has served on our board of directors since July 2015. Since February 2016, Mr. Balthrop has served on the board of directors of Oxford Immunotec Global PLC, a diagnostics company. Since January 2015, Mr. Balthrop has been the Founding Principal of Apalachee Ventures, LLC, an investment and advisory firm. From September 2004 to October 2014, Mr. Balthrop served on the board of directors and as Chief Executive Officer, President, and Director of Luminex Corporation, a diagnostics, tools, and devices company. Mr. Balthrop holds a B.S. in Biology from Spring Hill College and an M.B.A. from the Kellogg School of Management at Northwestern University. Mr. Balthrop was selected to serve on our board of directors because of his management experience in the healthcare and medical device industry.

A. Blaine Bowman. Mr. Bowman has served on our board of directors since May 2019. Beginning in 2006, Mr. Bowman served on the board of directors of Solexa, Inc., a DNA sequencing company, until its sale to Illumina, Inc., a biotechnology company, after which Mr. Bowman continued to serve on the board of directors until May 2018. From March 1977 to August 2005, Mr. Bowman served in various roles at Dionex Corporation, a manufacturer of analytical instruments, including Chairman of the board of directors, President, and Chief Executive Officer, and he served on the board of directors until its sale to Thermo Fisher Scientific Inc. in May 2011. From July 2012 to December 2015, Mr. Bowman served on the board of directors of Altera Corporation, a programmable logic devices company. Mr. Bowman holds a B.S. in Physics from Brigham Young University and an M.B.A. from the Stanford Graduate School of Business. Mr. Bowman was selected to serve on our board of directors because of his experience in executive roles and his experience serving on the boards of directors of various instrumentation and biotechnology companies.

Alan Colowick, M.D. Dr. Colowick has served on our board of directors since May 2019. Since May 2017, Dr. Colowick has served as a Partner at Sofinnova Investment, Inc., a clinical stage life sciences venture capital firm. From February 2010 to April 2017, Dr. Colowick held various positions, including Executive Vice President, at Celgene Corporation, a pharmaceutical company. From February 2008 to January 2010, Dr. Colowick served as the Chief Executive Officer of Gloucester Pharmaceuticals Inc., an early stage cancer pharmaceutical company, until its acquisition by Celgene Corporation in January 2010. From October 2006 to February 2008, Dr. Colowick served as President, Oncology at Geron Corporation, an early stage pharmaceutical company. Earlier in his career, Dr. Colowick served in various capacities at Amgen Inc., a biopharmaceutical company. Dr. Colowick has served on the board of directors of Human Longevity, Inc., a genomics-based health intelligence company, since June 2016, and has served on the board of directors of Principia Biopharma Inc., a biopharmaceutical company, since February 2017. Dr. Colowick previously served on the board of directors of Achaogen, Inc., a biopharmaceutical company, from August 2015 to August 2017, and on the board of directors of Dimension Therapeutics, Inc., a biopharmaceutical company, from August 2015 to November 2017. Dr. Colowick holds a B.S. in Molecular Biology from the University of Colorado, an M.D. from Stanford University School of Medicine, and an M.P.H. from the Harvard School of Public Health. Dr. Colowick was selected to serve on our board of directors because of his educational background in sciences, as well as financial understanding of the biotechnology industry gained from his investing experience.

Kenneth Ludlum. Mr. Ludlum has served on our board of directors since July 2015. Since January 2002, Mr. Ludlum has served on the board of directors of NATUS Medical, Inc., a medical device and equipment company. From February 2014 to April 2016, Mr. Ludlum served as Chief Financial Officer at CareDx, a molecular diagnostics company. Mr. Ludlum holds a B.S. in Business Administration from Lehigh University and an M.B.A. from Columbia Business School. Mr. Ludlum was selected to serve on our board of directors because of his experience working for and with healthcare, medical device, biotechnology, and diagnostic companies and his expertise in finance, accounting, and general management.

Jonathan MacQuitty, Ph.D. Dr. MacQuitty, our Chairman of the Board, has served on our board of directors since June 2011. Since July 2018, Dr. MacQuitty has served on the board of directors of and as Chief Executive Officer of D2G Oncology, Inc., an oncology biotechnology company. Since April 2016, Dr. MacQuitty has served as a Venture Partner at Lightspeed Venture Partners, an early-stage technology venture capital firm. From May 2015 to April 2017, Dr. MacQuitty served as Chief Executive Officer of Forty Seven, Inc., an immuno-oncology company. From May 1999 to December 2014, Dr. MacQuitty served in various roles, including Partner, at Abingworth Management Inc., a trans-Atlantic bio-investment firm. Dr. MacQuitty holds a B.A. and M.A. in Chemistry from Oxford University, a Ph.D. in Chemistry from the University of Sussex, and an M.B.A. from the Stanford Graduate School of Business. Dr. MacQuitty was selected to serve on our board of directors because of his operational experience in life science companies.

Paul Ricci. Mr. Ricci has served on our board of directors since February 2019. Since October 2018, Mr. Ricci has served as an Advisor to Lightspeed Venture Partners, an early-stage technology venture capital firm. Since September 2018, Mr. Ricci has served as an Advisor to Warburg Pincus, a private equity firm. Mr. Ricci served as Chief Executive Officer of Nuance Communications, Inc., a computer software technology company, from August 2000 to March 2018 and as its Chairman from March 1999 to February 2018. Mr. Ricci holds a B.A. and an M.A. in Economics from Stanford University. Mr. Ricci was selected to serve on our board of directors because of his management abilities and experience.

Composition of Our Board of Directors

Our business and affairs are managed under the direction of our board of directors. We currently have seven directors and two vacancies. The following members of our board of directors were elected pursuant to our current certificate of incorporation, as amended, and under the provisions of our amended and restated voting agreement, which requires the stockholders who are party to the agreement to vote their respective shares of our capital stock to elect directors as follows:

- John West, as the individual serving as our Chief Executive Officer and elected by the holders of our common stock;
- one individual designated by Abingworth Bioventures V LP and elected by the holders of our preferred stock (currently vacant);
- Jonathan MacQuitty, Ph.D., as the individual designated by Lightspeed General Partner VIII, L.P. and elected by the holders of our preferred stock;
- one individual jointly designated by Abingworth Bioventures V LP and Lightspeed General Partner VIII, L.P. and elected by the holders of our preferred stock (currently vacant); and
- Patrick Balthrop, Alan Colowick, M.D., and Kenneth Ludlum, as independent individuals designated by our board of directors and elected by the holders of our capital stock.

In addition, pursuant to our current certificate of incorporation, as amended, the holders of our capital stock elected A. Blaine Bowman and Paul Ricci as at-large directors.

The provisions of our amended and restated voting agreement relating to the election of our directors will terminate and the provisions of our current certificate of incorporation by which our directors were elected will

be amended and restated in connection with this offering. After the closing of this offering, the number of directors will be fixed by our board of directors, subject to the terms of our amended and restated certificate of incorporation and amended and restated bylaws that will become effective immediately prior to the closing of this offering. Each of our current directors will continue to serve as a director until the election and qualification of their successor, or until their earlier death, resignation, or removal.

Our board of directors may establish the authorized number of directors from time to time by resolution. In accordance with our amended and restated certificate of incorporation that will be in effect on the closing of this offering, immediately after this offering our board of directors will be divided into three classes with staggered three-year terms. At each annual general meeting of stockholders, the successors to directors whose terms then expire will be elected to serve from the time of election and qualification until the third annual meeting following election. Our directors will be divided among the three classes as follows:

- the Class I directors will be Messrs. Balthrop and Ludlum, and their terms will expire at our first annual meeting of stockholders following this offering;
- the Class II directors will be Messrs. West and Ricci and Dr. Colowick, and their terms will expire at our second annual meeting of stockholders following this offering; and
- the Class III directors will be Mr. Bowman and Dr. MacQuitty, and their terms will expire at our third annual meeting of stockholders following this offering.

We expect that any additional directorships resulting from an increase in the number of directors will be distributed among the three classes so that, as nearly as possible, each class will consist of one third of the directors. The division of our board of directors into three classes with staggered three-year terms may delay or prevent a change of our management or a change in control.

Director Independence

Our board of directors has undertaken a review of the independence of each director. Based on information provided by each director concerning his background, employment, and affiliations, our board of directors has determined that Messrs. Balthrop, Bowman, Ludlum, and Ricci and Drs. Colowick and MacQuitty do not have relationships that would interfere with the exercise of independent judgment in carrying out the responsibilities of a director and that each of these directors is “independent” as that term is defined under the applicable listing standards. In making these determinations, our board of directors considered the current and prior relationships that each non-employee director has with our company and all other facts and circumstances our board of directors deemed relevant in determining their independence, including the beneficial ownership of our shares held by each non-employee director and the transactions described in the section titled “Certain Relationships and Related Party Transactions.”

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. The composition and responsibilities of each of the committees of our board of directors are described below. Members serve on these committees until their resignation or until otherwise determined by our board of directors. Our board of directors may establish other committees as it deems necessary or appropriate from time to time.

Audit Committee

Our audit committee consists of Messrs. Bowman, Ludlum, and Ricci. Our board of directors has determined that each member of the audit committee satisfies the independence requirements under the Nasdaq listing standards and Rule 10A-3(b)(1) of the Exchange Act. The chair of our audit committee is Mr. Ludlum.

Our board of directors has determined that each of Mr. Ludlum, Mr. Bowman, and Mr. Ricci is an "audit committee financial expert" within the meaning of SEC regulations. Each member of our audit committee can read and understand fundamental financial statements in accordance with applicable requirements. In arriving at these determinations, our board of directors has examined each audit committee member's scope of experience and the nature of their employment.

The primary purpose of the audit committee is to discharge the responsibilities of our board of directors with respect to our corporate accounting and financial reporting processes, systems of internal control and financial statement audits, and to oversee our independent registered public accounting firm. Specific responsibilities of our audit committee include:

- helping our board of directors oversee our corporate accounting and financial reporting processes;
- managing the selection, engagement, qualifications, independence, and performance of a qualified firm to serve as the independent registered public accounting firm to audit our financial statements;
- discussing the scope and results of the audit with the independent registered public accounting firm, and reviewing, with management and the independent accountants, our interim and year-end operating results;
- developing procedures for employees to submit concerns anonymously about questionable accounting or audit matters;
- reviewing related person transactions;
- obtaining and reviewing a report by the independent registered public accounting firm at least annually that describes our internal quality control procedures, any material issues with such procedures, and any steps taken to deal with such issues when required by applicable law; and
- approving or, as permitted, pre-approving, audit and permissible non-audit services to be performed by the independent registered public accounting firm.

Our audit committee will operate under a written charter, to be effective prior to the closing of this offering, that satisfies the applicable listing standards of Nasdaq.

Compensation Committee

Our compensation committee consists of Messrs. Balthrop and Ricci and Dr. MacQuitty. The chair of our compensation committee is Dr. MacQuitty. Our board of directors has determined that each member of the compensation committee is independent under the listing standards of Nasdaq, and a "non-employee director" as defined in Rule 16b-3 promulgated under the Exchange Act.

The primary purpose of our compensation committee is to discharge the responsibilities of our board of directors in overseeing our compensation policies, plans and programs and to review and determine the compensation to be paid to our executive officers, directors and other senior management, as appropriate. Specific responsibilities of our compensation committee include:

- reviewing and recommending to our board of directors the compensation of our chief executive officer and other executive officers;
- reviewing and recommending to our board of directors the compensation of our directors;
- administering our equity incentive plans and other benefit programs;
- reviewing, adopting, amending, and terminating incentive compensation and equity plans, severance agreements, profit sharing plans, bonus plans, change-of-control protections, and any other compensatory arrangements for our executive officers and other senior management; and

- reviewing and establishing general policies relating to compensation and benefits of our employees, including our overall compensation philosophy.

Our compensation committee will operate under a written charter, to be effective prior to the closing of this offering, that satisfies the applicable listing standards of Nasdaq.

Nominating and Corporate Governance Committee

Our nominating and corporate governance committee consists of Mr. Balthrop and Dr. Colowick. The chair of our nominating and corporate governance committee is Mr. Balthrop. Our board of directors has determined that each member of the nominating and corporate governance committee is independent under the listing standards of Nasdaq.

Specific responsibilities of our nominating and corporate governance committee include:

- identifying and evaluating candidates, including the nomination of incumbent directors for reelection and nominees recommended by stockholders, to serve on our board of directors;
- considering and making recommendations to our board of directors regarding the composition and chairmanship of the committees of our board of directors;
- developing and making recommendations to our board of directors regarding corporate governance guidelines and matters; and
- overseeing periodic evaluations of the board of directors' performance, including committees of the board of directors.

Our nominating and corporate governance committee will operate under a written charter, to be effective prior to the closing of this offering, that satisfies the applicable listing standards of Nasdaq.

Code of Business Conduct and Ethics

We have adopted a code of business conduct and ethics 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, our code of business conduct and ethics will be available under the Corporate Governance section of our website at https://www.personalis.com. In addition, we intend to post on our website all disclosures that are required by law or the listing standards of Nasdaq concerning any amendments to, or waivers from, any provision of the code. The reference to our website address does not constitute incorporation by reference of the information contained at or available through our website, and you should not consider it to be a part of this prospectus.

Compensation Committee Interlocks and Insider Participation

None of the members of the compensation committee is currently or has been at any time one of our officers or employees. None of our executive officers currently serves, or has served during the last year, as a member of the board of directors or compensation committee of any entity that has one or more executive officers serving as a member of our board of directors or compensation committee.

Non-Employee Director Compensation

During fiscal 2018, we did not pay cash compensation to any of our non-employee directors for service on our board of directors.

In April 2018, the board of directors granted a stock option to purchase 12,500 shares of our common stock to Mr. Balthrop at an exercise price per share of $3.80. The shares underlying the option vest in 12 equal monthly

installments measured from August 17, 2018, subject to Mr. Balthrop's continuous service with us as of each such vesting date. In April 2018, the board of directors granted a stock option to purchase 12,500 shares of our common stock to Mr. Ludlum at an exercise price per share of $3.80. The shares underlying the option vest in 12 equal monthly installments measured from June 20, 2018, subject to Mr. Ludlum's continuous service with us as of each such vesting date. In April 2018, the board of directors granted a stock option to purchase 18,750 shares of our common stock to Dr. MacQuitty at an exercise price per share of $3.80. The shares underlying the option vest in 12 equal monthly installments measured from February 1, 2018, subject to Dr. MacQuitty's continuous service with us as of each such vesting date.

Upon a change in control (as defined in the 2011 Plan), the vesting of each option described above shall accelerate in full.

In addition, we have reimbursed and will continue to reimburse all of our non-employee directors for their reasonable out-of-pocket expenses incurred in attending board of directors and committee meetings.

The following table sets forth information regarding the compensation earned by or paid to our directors during the year ended December 31, 2018, other than John West, our President and Chief Executive Officer, who is also a member of our board of directors but did not receive any additional compensation for service as a director. The compensation of Mr. West as a named executive officer is set forth below under "Executive Compensation—Summary Compensation Table." Because each of A. Blaine Bowman, Alan Colowick, and Paul Ricci joined our board of directors in 2019 and did not earn or receive any compensation from us in 2018, Mr. Bowman, Dr. Colowick, and Mr. Ricci are not included in the following table.

Name	Fees Earned or Paid in Cash ($)	Option Awards ($)(1)	Total ($)
Patrick Balthrop	—	26,146	26,146
Kenneth Ludlum	—	26,146	26,146
Jonathan MacQuitty, Ph.D.	—	39,276	39,276
Vincent Miles, Ph.D.(2)	—	—	—
Christopher Schaepe(3)	—	—	—

(1) The amounts reported represent the aggregate grant date fair value of the stock options granted during fiscal 2018 under our 2011 Plan, computed in accordance with Financial Accounting Standards Board Accounting Standards Codification, Topic 718 ("ASC Topic 718"). The assumptions used in calculating the grant date fair value of the stock options reported in this column are set forth in the notes to our consolidated financial statements included elsewhere in this prospectus. This amount does not reflect the actual economic value that may be realized by the non-employee director.

(2) Dr. Miles resigned as a member of our board of directors on May 1, 2019.

(3) Mr. Schaepe resigned as a member of our board of directors on March 21, 2019.

EXECUTIVE COMPENSATION

Our named executive officers for the fiscal year ended December 31, 2018, consisting of our principal executive officer and the next two most highly compensated executive officers, were:

- John West, our President and Chief Executive Officer;
- Clinton Musil, our Chief Business Officer; and
- Richard Chen, M.D., M.S., our Chief Scientific Officer.

Summary Compensation Table

The following table presents all of the compensation awarded to, earned by, or paid to our named executive officers during the fiscal year ended December 31, 2018:

Name	Year	Salary ($)	Bonus ($)	Option Awards ($)(1)	Non-Equity Incentive Plan Compensation(2) ($)	All Other Compensation ($)	Total ($)
John West *President and Chief Executive Officer*	2018	421,750	—	879,452	190,250(3)	—	1,491,452
Clinton Musil *Chief Business Officer*	2018(4)	13,542	—	1,053,204	—	—	1,066,746
Richard Chen, M.D., M.S. *Chief Scientific Officer*	2018	370,031	—	335,934	135,000	—	840,965

(1) The amounts disclosed represent the aggregate grant date fair value of the stock options granted to our named executive officers during fiscal 2018 under our 2011 Plan, computed in accordance with ASC Topic 718. The assumptions used in calculating the grant date fair value of the stock options are set forth in the notes to our audited consolidated financial statements included elsewhere in this prospectus. This amount does not reflect the actual economic value that may be realized by the named executive officer.

(2) The amount disclosed represents the executive officer's total performance bonus earned for fiscal 2018 as described below under "—Annual Bonus Plan."

(3) The amount disclosed represents the grant date fair value of a stock option granted to Mr. West in 2019 in lieu of a performance-based cash bonus earned with respect to fiscal 2018 performance as described below under "—Annual Bonus Plan."

(4) Mr. Musil began serving as our Chief Business Officer in December 2018.

Annual Bonus Plan

Our executive officers are eligible to receive performance-based cash bonuses, which are designed to provide appropriate incentives to our executives to achieve defined performance goals and to reward our executives for individual achievement toward these goals. The performance-based bonus each executive officer is eligible to receive is generally based on the extent to which we achieve the corporate goals that our board or compensation committee establishes and is paid annually. Annually, the compensation committee of our board of directors reviews the company's performance and determines the actual bonus payout to be awarded to each of our eligible executive officers.

Bonuses based on fiscal 2017 performance were paid in April 2018. Because the compensation committee of our board of directors determined that the performance goals with respect to the fiscal 2017 bonuses were achieved at the 100% level, the 2017 bonuses were paid at the 100% level. Mr. West earned a bonus for fiscal 2017 performance based on our achievement of the relevant performance targets for Mr. West. At the request of

Mr. West, the board of directors determined to pay his 2017 bonus in the form of a fully vested stock option grant exercisable for 25,000 shares of common stock. Because Mr. Musil began his employment with us in December 2018, he was not eligible for any fiscal 2017 bonus. Dr. Chen earned a bonus for fiscal 2017 performance based on our achievement of the relevant performance targets for Dr. Chen and his 2017 bonus was paid in cash.

For fiscal 2018, Mr. West was eligible to receive a bonus at an annual target of 50% of salary earned during the year. For fiscal 2018, Dr. Chen was eligible to receive a bonus at an annual target of 30% of salary earned during the year.

Employment Agreements

We have entered into an employment agreement or offer letter with each of our named executive officers. In June 2019, we entered into revised employment agreements with each of our named executive officers setting forth the terms and conditions of such executive's employment with us. In addition, each of our named executive officers has executed our standard confidential information and invention assignment agreement. Any potential payments and benefits due upon a termination of employment or change in control are described and quantified below in "—Potential Payments upon Termination or Change in Control."

John West

We entered into an initial employment agreement with Mr. West, our Chief Executive Officer, dated August 3, 2011, which set forth the initial terms and conditions of his employment with us. In June 2019, we entered into a revised employment agreement with Mr. West, which replaced and superseded Mr. West's prior employment agreement. Pursuant to the new agreement, Mr. West's base salary is $500,000 per year. Mr. West is also eligible to participate in our annual bonus plan, as adopted by our board of directors, with a bonus of up to 70% of his base salary, and a target bonus amount equal to 40% of his annual base salary at target levels of performance. In addition, Mr. West is eligible to receive long-term and short-term disability coverage in an amount of at least $179,375 in annual benefits.

Finally, Mr. West is eligible to receive a long term bonus within 60 days following the date on which the Company reaches a valuation of $1 billion or greater (as determined by (i) the average closing price per share over the trailing 30 calendar days multiplied by (ii) the number of outstanding shares of the applicable class of publicly traded stock, as calculated on a fully diluted basis), subject to his continued employment through such time. If triggered by such a valuation event, Mr. West's long term bonus is payable in shares of common stock having an aggregate grant date fair value equal to 1% of the difference between (A) the valuation of the Company (as determined by the formula described above) and (B) the aggregate gross proceeds to us, before deducting any underwriting discounts or commission or expenses payable by us, from the sale and issuance of equity securities, including this offering, from our inception through the date of the valuation event. Mr. West's employment is at will and may be terminated at any time, with or without cause.

Clinton Musil

We entered into an initial offer letter with Mr. Musil, our Chief Business Officer, dated December 14, 2018, which set forth the initial terms and conditions of his employment with us. In June 2019, we entered into an employment agreement with Mr. Musil, which replaced and superseded Mr. Musil's prior offer letter. Pursuant to the new agreement, Mr. Musil's base salary is $325,000 per year. Mr. Musil is also eligible to participate in our annual bonus plan, as adopted by our board of directors, with a bonus target of 30% of his base salary. Mr. Musil's employment is at will and may be terminated at any time, with or without cause.

Richard Chen, M.D., M.S.

We entered into an initial offer letter with Dr. Chen, our Chief Scientific Officer, dated November 23, 2011, which set forth the initial terms and conditions of his employment with us. In June 2019, we entered into an

employment agreement with Dr. Chen, which replaced and superseded Dr. Chen's prior offer letter. Pursuant to the new agreement, Dr. Chen's base salary is $400,001 per year. Dr. Chen is also eligible to participate in our annual bonus plan, as adopted by our board of directors, with a bonus target of 30% of his base salary. Dr. Chen's employment is at will and may be terminated at any time, with or without cause.

Potential Payments upon Termination or Change in Control

Regardless of the manner in which a named executive officer's service terminates, each named executive officer is entitled to receive amounts earned during his or her term of service, including unpaid salary and unused vacation.

We have entered into an agreement with each of our named executive officers with respect to potential payments and benefits due upon a termination of employment or change in control. In June 2019 we entered into revised executive severance agreements with each of our named executive officers setting forth the terms and conditions of such potential payments and benefits due upon a termination of employment or change in control.

John West

If Mr. West's long term bonus is not previously triggered by a valuation event (as described above under "—Employment Agreements—John West") and a "change in control" (as defined in his new employment agreement) occurs, then, subject to his continued employment through such time, Mr. West is eligible to receive a long term bonus within 60 days of the effective date of the change in control. In such instance, the long term bonus will be 1% of the difference between (A) the net present value for financial accounting purposes, calculated at closing of the change in control, of the "total consideration" as defined in his new employment agreement and as reasonably determined by our board of directors, and (B) the aggregate gross proceeds to us, before deducting any underwriting discounts or commission or expenses payable by us, from the sale and issuance of equity securities, including this offering, from our inception through the date of the change in control event. If triggered by a change in control, Mr. West's long term bonus is payable in the same mix of cash, securities and other property as received by other stockholders in such change in control.

Mr. West is also entitled to accelerated vesting for each of his then-outstanding unvested equity awards that would have vested within the next 12 months if a "change in control" (as defined in his new employment terms letter) occurs during his employment with us.

Mr. West's executive severance agreement provides that if Mr. West's employment is terminated by us without "cause" (and other than as a result of his death or disability) or by Mr. West for "good reason" (each as defined in the executive severance agreement), then he will be entitled to 12 months of his then-current base salary, up to 12 months of payment of COBRA premiums for himself and his eligible dependents (or a taxable monthly payment in lieu of such payment), and accelerated vesting for each of his then-outstanding unvested equity awards that would have vested within 24 months of the date of his termination of employment, all subject to the timely execution of an effective release.

Clinton Musil

Mr. Musil's executive severance agreement provides that if Mr. Musil's employment is terminated by us without "cause" (and other than as a result of his death or disability) or by Mr. Musil for "good reason" (each as defined in the executive severance agreement), in either case within 12 months after a "change in control" (as defined in the executive severance agreement), then he will be entitled to 9 months of his then-current base salary, up to 9 months of payment of COBRA premiums for himself and his eligible dependents (or a taxable monthly payment in lieu of such payment), and 100% acceleration of the unvested portions of any of his then-outstanding equity awards, all subject to the timely execution of an effective release.

Richard Chen, M.D., M.S.

Dr. Chen's executive severance agreement provides that if Dr. Chen's employment is terminated by us without "cause" (and other than as a result of his death or disability) or by Dr. Chen for "good reason" (each as defined in the executive severance agreement), in either case within 12 months after a "change in control" (as defined in the executive severance agreement), then he will be entitled to 9 months of his then-current base salary, up to 9 months of payment of COBRA premiums for himself and his eligible dependents (or a taxable monthly payment in lieu of such payment), and 100% acceleration of the unvested portions of any of his then-outstanding equity awards, all subject to the timely execution of an effective release.

In addition, each of our named executive officers' stock options are subject to the terms of the 2011 Plan and form of share option agreement thereunder. A description of the termination and change in control provisions in the 2011 Plan and stock options granted thereunder is provided below under "—Equity Incentive Plans."

Outstanding Equity Awards as of December 31, 2018

The following table presents the outstanding equity incentive plan awards held by each named executive officer as of December 31, 2018.

	Option Awards(1)				
Name	Grant Date	Number of Securities Underlying Unexercised Options Exercisable	Number of Securities Underlying Unexercised Options Unexercisable	Option Exercise Price Per Share(2)	Option Expiration Date
John West	3/7/2012(3)	562,500	—	$ 0.44	3/7/2022
	11/13/2013(3)	187,500	—	1.84	11/13/2023
	12/11/2013(3)	64,430	—	1.84	12/11/2023
	3/12/2014(3)	45,061	—	1.84	3/12/2024
	4/15/2015(3)	15,015	—	5.04	4/15/2025
	5/11/2016(3)	15,000	—	2.84	5/11/2026
	5/24/2017(4)	98,958	151,042	2.44	5/24/2027
	7/26/2017(3)	15,000	—	2.44	7/26/2027
	4/25/2018(3)	25,000	—	3.80	4/25/2028
	4/25/2018(5)	27,777	97,223	3.80	4/25/2028
	12/24/2018(6)	—	150,000	7.32	12/24/2028
Clinton Musil	12/24/2018(7)	—	255,839	7.32	12/24/2028
Richard Chen, M.D., M.S.	3/7/2012(3)	289,250	—	0.44	3/7/2022
	11/13/2013(3)	55,000	—	1.84	11/13/2023
	5/24/2017(8)	39,583	60,417	2.44	5/24/2027
	4/25/2018(9)	8,333	29,167	3.80	4/25/2028
	12/14/2018(10)	—	62,500	7.32	12/14/2028

(1) All of the option awards were granted under the 2011 Plan, the terms of which plan is described below under "—Equity Incentive Plans."
(2) All of the option awards were granted with a per share exercise price equal to the fair market value of one share of our common stock on the date of grant, as determined in good faith by our board of directors or compensation committee.
(3) Fully vested as of December 31, 2018.
(4) The shares subject to the option vest in 48 equal monthly installments measured from May 1, 2017, subject to continuous service as of each such vesting date.
(5) The shares subject to the option vest in 36 equal monthly installments measured from May 1, 2018, subject to continuous service as of each such vesting date.

(6) The shares subject to the option vest in 48 equal monthly installments measured from December 14, 2018, subject to continuous service as of each such vesting date.
(7) 20% of the shares subject to the option vest upon the closing of this offering, 20% of the shares subject to the option vest on December 17, 2019, and the remaining shares vest in 36 equal monthly installments thereafter, subject to continuous service as of each such vesting date.
(8) The shares subject to the option vest in 48 equal monthly installments measured from May 1, 2017, subject to continuous service as of each such vesting date.
(9) The shares subject to the option vest in 36 equal monthly installments measured from May 1, 2018, subject to continuous service as of each such vesting date.
(10) The shares subject to the option vest in 48 equal monthly installments measured from December 14, 2018, subject to continuous service as of each such vesting date.

Other Compensation and Benefits

All of our current named executive officers are eligible to participate in our employee benefit plans, including our medical, dental, vision, life, disability, and accidental death and dismemberment insurance plans, in each case on the same basis as all of our other employees. We pay the premiums for the life, disability, and accidental death and dismemberment insurance for all of our employees, including our named executive officers. We generally do not provide perquisites or personal benefits to our named executive officers.

Our named executive officers did not participate in, or earn any benefits under, any nonqualified deferred compensation plan sponsored by us during the fiscal year ended December 31, 2018. Our board of directors may elect to provide our officers and other employees with nonqualified deferred compensation benefits in the future if it determines that doing so is in our best interests.

Our named executive officers did not participate in, or otherwise receive any benefits under, any pension or retirement plan sponsored by us during fiscal 2018.

Employee Benefit and Stock Plans

The principal features of our equity incentive plans and 401(k) plan are summarized below. These summaries are qualified in their entirety by reference to the actual text of the plans, which, other than the 401(k) plan, are filed as exhibits to the registration statement of which this prospectus is a part.

2019 Equity Incentive Plan

Our board of directors adopted and our stockholders approved our 2019 Equity Incentive Plan (the "2019 Plan") in May 2019, and June 2019, respectively. The 2019 Plan will become effective, and no stock awards may be granted under the 2019 Plan until, immediately prior to the execution of the underwriting agreement related to this offering. Once the 2019 Plan is effective, no further grants will be made under the 2011 Plan.

Stock Awards. The 2019 Plan provides for the grant of incentive stock options ("ISOs") within the meaning of Section 422 of the Code, nonstatutory stock options ("NSOs"), stock appreciation rights, restricted stock awards, restricted stock unit awards, performance-based stock awards, and other forms of equity compensation, which are collectively referred to as stock awards. Additionally, the 2019 Plan provides for the grant of performance cash awards. ISOs may be granted only to our employees and to any of our parent or subsidiary corporation's employees. All other awards may be granted to employees, including officers, and to non-employee directors and consultants of ours and any of our affiliates.

Share Reserve. Initially, the aggregate number of shares of our common stock that may be issued pursuant to stock awards under the 2019 Plan is 7,440,524 shares, which number is the sum of (i) 2,000,000 shares plus (ii) the number of shares reserved, and remaining available for issuance, under our 2011 Plan at the time our

2019 Plan became effective and (iii) the number of shares subject to stock options or other stock awards granted under our 2011 Plan that would have otherwise returned to our 2011 Plan (such as upon the expiration or termination of a stock award prior to vesting). The number of shares of our common stock reserved for issuance under our 2019 Plan will automatically increase on January 1 of each year, beginning on January 1, 2020 and continuing through and including January 1, 2029, by 5% of the total number of shares of our capital stock outstanding on December 31 of the preceding calendar year, or a lesser number of shares determined by our board of directors. The maximum number of shares that may be issued upon the exercise of ISOs under our 2019 Plan is three times the share reserve, or 22,321,572 shares.

If a stock award granted under the 2019 Plan expires or otherwise terminates without being exercised in full, or is settled in cash, the shares of our common stock not acquired pursuant to the stock award again will become available for subsequent issuance under the 2019 Plan. In addition, the following types of shares under the 2019 Plan may become available for the grant of new stock awards under the 2019 Plan: (1) shares that are forfeited to or repurchased by us prior to becoming fully vested; (2) shares withheld to satisfy income or employment withholding taxes; or (3) shares used to pay the exercise or purchase price of a stock award. Shares issued under the 2019 Plan may be previously unissued shares or reacquired shares bought by us on the open market.

The maximum number of shares of common stock subject to stock awards granted under the 2019 Plan or otherwise during any one calendar year to any non-employee director, taken together with any cash fees paid by us to such non-employee director during such calendar year for service on the board of directors, will not exceed $750,000 in total value (calculating the value of any such stock awards based on the grant date fair value of such stock awards for financial reporting purposes), or, with respect to the calendar year in which a non-employee director is first appointed or elected to our board of directors, $900,000.

Administration. Our board of directors, or a duly authorized committee thereof, has the authority to administer the 2019 Plan. Our board of directors may also delegate to one or more of our officers the authority to (1) designate employees (other than other officers) to be recipients of certain stock awards, (2) determine the number of shares of common stock to be subject to such stock awards, and (3) specify the other terms and conditions, including the strike price or purchase price and vesting schedule, applicable to such awards. Subject to the terms of the 2019 Plan, our board of directors or the authorized committee, referred to as the plan administrator, determines recipients, dates of grant, the numbers and types of stock awards to be granted, and the terms and conditions of the stock awards, including the period of their exercisability and the vesting schedule applicable to a stock award. Subject to the limitations set forth below, the plan administrator will also determine the exercise price, strike price, or purchase price of stock awards granted and the types of consideration to be paid for the stock award.

The plan administrator has the authority to modify outstanding stock awards under our 2019 Plan. Subject to the terms of our 2019 Plan, the plan administrator has the authority, without stockholder approval, to reduce the exercise, purchase, or strike price of any outstanding stock award, cancel any outstanding stock award in exchange for new stock awards, cash, or other consideration, or take any other action that is treated as a repricing under generally accepted accounting principles, with the consent of any adversely affected participant.

Stock Options. ISOs and NSOs are evidenced by stock option agreements adopted by the plan administrator. The plan administrator determines the exercise price for a stock option, within the terms and conditions of the 2019 Plan, provided that the exercise price of a stock option generally cannot be less than 100% of the fair market value of our common stock on the date of grant. Options granted under the 2019 Plan vest at the rate specified by the plan administrator.

The plan administrator determines the term of stock options granted under the 2019 Plan, up to a maximum of 10 years. Unless the terms of an option holder’s stock option agreement provide otherwise, if an option holder’s service relationship with us, or any of our affiliates, ceases for any reason other than disability, death, or cause, the option holder may generally exercise any vested options for a period of three months following the

cessation of service. The option term will automatically be extended in the event that exercise of the option following such a termination of service is prohibited by applicable securities laws or our insider trading policy. If an option holder's service relationship with us or any of our affiliates ceases due to disability or death, or an option holder dies within a certain period following cessation of service, the option holder or a beneficiary may generally exercise any vested options for a period of 12 months in the event of disability and 18 months in the event of death. In the event of a termination for cause, options generally terminate immediately. In no event may an option be exercised beyond the expiration of its term.

Acceptable consideration for the purchase of common stock issued upon the exercise of a stock option will be determined by the plan administrator and may include (1) cash, check, bank draft or money order, (2) a broker-assisted cashless exercise, (3) the tender of shares of our common stock previously owned by the option holder, (4) a net exercise of the option if it is an NSO, and (5) other legal consideration approved by the plan administrator.

Unless the plan administrator provides otherwise, options generally are not transferable except by will, the laws of descent and distribution, or pursuant to a domestic relations order. An option holder may designate a beneficiary, however, who may exercise the option following the option holder's death.

Tax Limitations on ISOs. The aggregate fair market value, determined at the time of grant, of our common stock with respect to ISOs that are exercisable for the first time by an option holder during any calendar year under all of our stock plans may not exceed $100,000. Options or portions thereof that exceed such limit will be treated as NSOs. No ISOs may be granted to any person who, at the time of the grant, owns or is deemed to own stock possessing more than 10% of our total combined voting power or that of any of our parent or subsidiary corporations, unless (1) the option exercise price is at least 110% of the fair market value of the stock subject to the option on the date of grant and (2) the term of the ISO does not exceed five years from the date of grant.

Restricted Stock Awards. Restricted stock awards are evidenced by restricted stock award agreements adopted by the plan administrator. Restricted stock awards may be granted in consideration for (1) cash, check, bank draft, or money order, (2) services rendered to us or our affiliates, or (3) any other form of legal consideration. Common stock acquired under a restricted stock award may, but need not, be subject to a share repurchase option in our favor in accordance with a vesting schedule as determined by the plan administrator. Rights to acquire shares under a restricted stock award may be transferred only upon such terms and conditions as set by the plan administrator. Except as otherwise provided in the applicable award agreement, restricted stock awards that have not vested will be forfeited upon the participant's cessation of continuous service for any reason.

Restricted Stock Unit Awards. Restricted stock unit awards are evidenced by restricted stock unit award agreements adopted by the plan administrator. Restricted stock unit awards may be granted in consideration for any form of legal consideration or for no consideration. A restricted stock unit award may be settled by cash, delivery of stock, a combination of cash and stock as deemed appropriate by the plan administrator, or in any other form of consideration set forth in the restricted stock unit award agreement. Additionally, dividend equivalents may be credited in respect of shares covered by a restricted stock unit award. Rights under a restricted stock unit award may be transferred only upon such terms and conditions as set by the plan administrator. Restricted stock unit awards may be subject to vesting as determined by the plan administrator. Except as otherwise provided in the applicable award agreement, restricted stock units that have not vested will be forfeited upon the participant's cessation of continuous service for any reason.

Stock Appreciation Rights. Stock appreciation rights are evidenced by stock appreciation grant agreements adopted by the plan administrator. The plan administrator determines the strike price for a stock appreciation right, which generally cannot be less than 100% of the fair market value of our common stock on the date of grant. Upon the exercise of a stock appreciation right, we will pay the participant an amount in cash or stock equal to (1) the excess of the per share fair market value of our common stock on the date of exercise over the

strike price, multiplied by (2) the number of shares of common stock with respect to which the stock appreciation right is exercised. A stock appreciation right granted under the 2019 Plan vests at the rate specified in the stock appreciation right agreement as determined by the plan administrator.

The plan administrator determines the term of stock appreciation rights granted under the 2019 Plan, up to a maximum of 10 years. Unless the terms of a participant's stock appreciation right agreement provides otherwise, if a participant's service relationship with us or any of our affiliates ceases for any reason other than cause, disability, or death, the participant may generally exercise any vested stock appreciation right for a period of three months following the cessation of service. The stock appreciation right term will be further extended in the event that exercise of the stock appreciation right following such a termination of service is prohibited by applicable securities laws. If a participant's service relationship with us, or any of our affiliates, ceases due to disability or death, or a participant dies within a certain period following cessation of service, the participant or a beneficiary may generally exercise any vested stock appreciation right for a period of 12 months in the event of disability and 18 months in the event of death. In the event of a termination for cause, stock appreciation rights generally terminate immediately upon the occurrence of the event giving rise to the termination of the individual for cause. In no event may a stock appreciation right be exercised beyond the expiration of its term.

Unless the plan administrator provides otherwise, stock appreciation rights generally are not transferable except by will, the laws of descent and distribution, or pursuant to a domestic relations order. A stock appreciation right holder may designate a beneficiary, however, who may exercise the stock appreciation right following the holder's death.

Performance Awards. Our 2019 Plan permits the grant of performance-based stock and cash awards. The performance goals that may be selected include one or more of the following: (1) earnings (including earnings per share and net earnings); (2) earnings before interest, taxes, and depreciation; (3) earnings before interest, taxes, depreciation, and amortization; (4) total stockholder return; (5) return on equity or average stockholder's equity; (6) return on assets, investment, or capital employed; (7) stock price; (8) margin (including gross margin); (9) income (before or after taxes); (10) operating income; (11) operating income after taxes; (12) pre-tax profit; (13) operating cash flow; (14) sales or revenue targets; (15) increases in revenue or product revenue; (16) expenses and cost reduction goals; (17) improvement in or attainment of working capital levels; (18) economic value added (or an equivalent metric); (19) market share; (20) cash flow; (21) cash flow per share; (22) share price performance; (23) debt reduction; (24) customer satisfaction; (25) stockholders' equity; (26) capital expenditures; (27) debt levels; (28) operating profit or net operating profit; (29) workforce diversity; (30) growth of net income or operating income; (31) billings; (32) implementation or completion of projects or processes; (33) financing; (34) regulatory milestones; (35) stockholder liquidity; (36) corporate governance and compliance; (37) product commercialization; (38) intellectual property; (39) personnel matters; (40) progress of internal research or clinical programs; (41) progress of partnered programs; (42) partner satisfaction; (43) budget management; (44) clinical achievements; (45) completing phases of a clinical study (including the treatment phase); (46) announcing or presenting preliminary or final data from clinical studies, in each case, whether on particular timelines or generally; (47) timely completion of clinical trials; (48) submission of Device Master File(s) and other regulatory achievements; (49) partner or collaborator achievements; (50) internal controls, including those related to the Sarbanes-Oxley Act of 2002; (51) research progress, including the development of programs; (52) investor relations, analysts, and communication; (53) manufacturing achievements (including obtaining particular yields from manufacturing runs and other measurable objectives related to process development activities); (54) strategic partnerships or transactions (including in-licensing and out-licensing of intellectual property); (55) establishing relationships with commercial entities with respect to the marketing, distribution and sale of our products and services (including with group purchasing organizations, distributors and other vendors); (56) supply chain achievements (including establishing relationships with manufacturers, suppliers and other services providers of our products and services); (57) co-development, co-marketing, profit sharing, joint venture, or other similar arrangements; (58) individual performance goals; (59) corporate development and planning goals; and (60) other measures of performance selected by our board of directors or any committee thereof.

The performance goals may be based on company-wide performance or performance of one or more business units, divisions, affiliates, or business segments, and may be either absolute or relative to the performance of one or more comparable companies or the performance of one or more relevant indices. Unless specified otherwise in the award agreement at the time the award is granted or in such other document setting forth the performance goals at the time the goals are established, we will appropriately make adjustments in the method of calculating the attainment of performance goals as follows: (1) to exclude restructuring and/or other nonrecurring charges; (2) to exclude exchange rate effects; (3) to exclude the effects of changes to generally accepted accounting principles; (4) to exclude the effects of any statutory adjustments to corporate tax rates; (5) to exclude the effects of any items that are unusual in nature or occur infrequently as determined under generally accepted accounting principles; (6) to exclude the dilutive effects of acquisitions or joint ventures; (7) to assume that any business divested by us achieved performance objectives at targeted levels during the balance of a performance period following such divestiture; (8) to exclude the effect of any change in the outstanding shares of our common stock by reason of any stock dividend or split, stock repurchase, reorganization, recapitalization, merger, consolidation, spin-off, combination or exchange of shares, or other similar corporate change, or any distributions to common stockholders other than regular cash dividends; (9) to exclude the effects of stock-based compensation and the award of bonuses under our bonus plans; (10) to exclude costs incurred in connection with potential acquisitions or divestitures that are required to be expensed under generally accepted accounting principles; (11) to exclude the goodwill and intangible asset impairment charges that are required to be recorded under generally accepted accounting principles; and (12) to exclude the effect of any other unusual, nonrecurring gain or loss or other extraordinary item. In addition, we retain the discretion to adjust or eliminate the compensation or economic benefit due upon attainment of the goals. The performance goals may differ from participant to participant and from award to award.

Other Stock Awards. The plan administrator may grant other awards based in whole or in part by reference to our common stock. The plan administrator will set the number of shares under the stock award and all other terms and conditions of such awards.

Changes to Capital Structure. In the event that there is a specified type of change in our capital structure, such as a stock split or recapitalization, appropriate adjustments will be made to (1) the class and maximum number of shares reserved for issuance under the 2019 Plan, (2) the class and maximum number of shares by which the share reserve may increase automatically each year, (3) the class and number of shares that may be issued upon the exercise of ISOs, and (4) the class and number of shares and exercise price, strike price, or purchase price, if applicable, of all outstanding stock awards.

Corporate Transactions. In the event of certain specified significant corporate transactions, the plan administrator has the discretion to take any of the following actions with respect to stock awards:

- arrange for the assumption, continuation, or substitution of a stock award by a surviving or acquiring entity or parent company;
- arrange for the assignment of any reacquisition or repurchase rights held by us to the surviving or acquiring entity or parent company;
- accelerate the vesting of the stock award and provide for its termination prior to the effective time of the corporate transaction;
- arrange for the lapse of any reacquisition or repurchase right held by us;
- cancel or arrange for the cancellation of the stock award in exchange for such cash consideration, if any, as our board of directors may deem appropriate; or
- make a payment equal to the excess of (1) the value of the property the participant would have received upon exercise of the stock award over (2) the exercise price or strike price otherwise payable in connection with the stock award.

Our plan administrator is not obligated to treat all stock awards, even those that are of the same type, in the same manner.

Under the 2019 Plan, a significant corporate transaction is generally the consummation of (1) a sale or other disposition of all or substantially all of our consolidated assets, (2) a sale or other disposition of at least 50% of our outstanding securities, (3) a merger, consolidation or similar transaction following which we are not the surviving corporation, or (4) a merger, consolidation, or similar transaction following which we are the surviving corporation but the shares of our common stock outstanding immediately prior to such transaction are converted or exchanged into other property by virtue of the transaction.

Change in Control. The plan administrator may provide, in an individual award agreement or in any other written agreement between a participant and us, that the stock award will be subject to additional acceleration of vesting and exercisability or settlement in the event of a change in control. Under the 2019 Plan, a change in control is generally (1) the acquisition by a person or entity of more than 50% of our combined voting power other than by merger, consolidation or similar transaction, (2) a consummated merger, consolidation, or similar transaction immediately after which our stockholders do not own more than 50% of the combined voting power of the surviving entity (or its parent company), (3) a consummated sale, lease or exclusive license or other disposition of all or substantially all of our consolidated assets, and (4) certain dissolutions, liquidations and changes in the board of directors.

Amendment and Termination. Our board of directors has the authority to amend, suspend, or terminate our 2019 Plan, provided that such action does not materially impair the existing rights of any participant without such participant's written consent and provided further that certain types of amendments will require the approval of our stockholders. No ISOs may be granted after the tenth anniversary of the date our board of directors adopts our 2019 Plan.

2019 Employee Stock Purchase Plan

Our board of directors adopted the 2019 Employee Stock Purchase Plan (the "ESPP") in May 2019, and our stockholders approved the ESPP in June 2019. The ESPP will become effective immediately prior to and contingent upon the date of the underwriting agreement related to this offering. The purpose of the ESPP is to secure the services of new employees, to retain the services of existing employees and to provide incentives for such individuals to exert maximum efforts toward our success and that of our affiliates. The ESPP is intended to qualify as an "employee stock purchase plan" within the meaning of Section 423 of the Code.

Share Reserve. Following this offering, the ESPP will authorize the issuance of 250,000 shares of our common stock pursuant to purchase rights granted to our employees or to employees of any of our designated affiliates. The number of shares of our common stock reserved for issuance will automatically increase on January 1 of each calendar year, from January 1, 2020 (assuming the ESPP becomes effective in 2019) through January 1, 2029, by the lesser of (1) 1% of the total number of shares of our common stock outstanding on December 31 of the preceding calendar year, and (2) 500,000 shares; *provided*, that prior to the date of any such increase, our board of directors may determine that such increase will be less than the amount set forth in clauses (1) and (2).

Administration. Our board of directors intends to delegate concurrent authority to administer the ESPP to our compensation committee. The ESPP is implemented through a series of offerings under which eligible employees are granted purchase rights to purchase shares of our common stock on specified dates during such offerings. Under the ESPP, we may specify offerings with durations of not more than 27 months, and may specify shorter purchase periods within each offering. Each offering will have one or more purchase dates on which shares of our common stock will be purchased for employees participating in the offering. An offering under the ESPP may be terminated under certain circumstances.

Payroll Deductions. Generally, all regular employees, including executive officers, employed by us or by any of our designated affiliates, may participate in the ESPP and may contribute, normally through payroll deductions, up to 15% of their earnings (as defined in the ESPP) for the purchase of our common stock under the ESPP. Unless otherwise determined by our board of directors, common stock will be purchased for the accounts of employees participating in the ESPP at a price per share equal to the lower of (a) 85% of the fair market value of a share of our common stock on the first trading date of an offering or (b) 85% of the fair market value of a share of our common stock on the date of purchase.

Limitations. Employees may have to satisfy one or more of the following service requirements before participating in the ESPP, as determined by our board of directors, including: (1) being customarily employed for more than 20 hours per week; (2) being customarily employed for more than five months per calendar year; or (3) continuous employment with us or one of our affiliates for a period of time (not to exceed two years). No employee may purchase shares under the ESPP at a rate in excess of $25,000 worth of our common stock based on the fair market value per share of our common stock at the beginning of an offering for each year such a purchase right is outstanding. Finally, no employee will be eligible for the grant of any purchase rights under the ESPP if immediately after such rights are granted, such employee has voting power over 5% or more of our outstanding capital stock measured by vote or value pursuant to Section 424(d) of the Code.

Changes to Capital Structure. In the event that there occurs a change in our capital structure through such actions as a stock split, merger, consolidation, reorganization, recapitalization, reincorporation, stock dividend, dividend in property other than cash, large nonrecurring cash dividend, liquidating dividend, combination of shares, exchange of shares, change in corporate structure, or similar transaction, the board of directors will make appropriate adjustments to (1) the number of shares reserved under the ESPP, (2) the maximum number of shares by which the share reserve may increase automatically each year, (3) the number of shares and purchase price of all outstanding purchase rights, and (4) the number of shares that are subject to purchase limits under ongoing offerings.

Corporate Transactions. In the event of certain significant corporate transactions, including (1) a sale of all or substantially all of our assets, (2) the sale or disposition of 50% of our outstanding securities, (3) the consummation of a merger or consolidation where we do not survive the transactions, and (4) the consummation of a merger or consolidation where we do survive the transaction but the shares of our common stock outstanding immediately prior to such transaction are converted or exchanged into other property by virtue of the transaction, any then-outstanding rights to purchase our stock under the ESPP may be assumed, continued, or substituted for by any surviving or acquiring entity (or its parent company). If the surviving or acquiring entity (or its parent company) elects not to assume, continue, or substitute for such purchase rights, then the participants' accumulated payroll contributions will be used to purchase shares of our common stock within 10 business days prior to such corporate transaction, and such purchase rights will terminate immediately.

ESPP Amendments, Termination. Our board of directors has the authority to amend or terminate our ESPP, provided that except in certain circumstances such amendment or termination may not materially impair any outstanding purchase rights without the holder's consent. We will obtain stockholder approval of any amendment to our ESPP, as required by applicable law or listing requirements.

2011 Equity Incentive Plan

Our board of directors adopted our 2011 Plan in October 2011, and our stockholders approved our 2011 Plan in November 2011. Our 2011 Plan has been periodically amended, most recently in February 2019. Our 2011 Plan will be terminated prior to the closing of this offering, and thereafter we will not grant any additional awards under our 2011 Plan. However, our 2011 Plan will continue to govern the terms and conditions of the outstanding awards previously granted thereunder, which include options and restricted stock awards.

Share Reserve. As of March 31, 2019, stock options covering 4,381,884 shares with a weighted-average exercise price of $3.62 per share were outstanding, and 1,068,799 shares of our common stock remained

available for the future grant of awards under our 2011 Plan. Any shares of our common stock remaining available for issuance under our 2011 Plan at the time our 2019 Plan becomes effective will become available for issuance under our 2019 Plan. In addition, any shares subject to options that expire or terminate prior to exercise or are withheld to satisfy tax withholding obligations with respect to or the exercise price of an option, and any shares of restricted stock that are forfeited to or repurchased by us due to failure to vest, will be added to the number of shares then available for issuance under our 2019 Plan.

Administration. Our board of directors or a committee delegated by our board of directors administers our 2011 Plan. Subject to the terms of our 2011 Plan, the administrator has the power to, among other things, determine who will be granted awards, to determine the terms and conditions of each award (including the number of shares, exercise price, if any, and any vesting conditions), to lower or reduce the exercise price of outstanding options, to accelerate the time(s) when an award may vest or be exercised, and to construe and interpret the terms of our 2011 Plan and awards granted thereunder.

Options and Restricted Stock. Options and restricted stock granted under our 2011 Plan are subject to terms and conditions generally similar to those described above with respect to options and restricted stock that may be granted under our 2019 Plan.

Changes to Capital Structure. In the event that there is a specified type of change in our capital structure, such as a stock split or recapitalization, appropriate adjustments will be made to (1) the class and maximum number of shares reserved for issuance under the 2011 Plan, (2) the class and maximum number of shares that may be issued upon the exercise of ISOs, and (3) the class and number of shares and price per share, if applicable, of all outstanding awards.

Corporate Transactions. In the event of certain specified significant corporate transactions, the administrator has the discretion to take any of the following actions with respect to awards:

- arrange for the assumption, continuation, or substitution of an award by a surviving or acquiring entity or parent company;
- arrange for the assignment of any reacquisition or repurchase rights held by us to the surviving or acquiring entity or parent company;
- accelerate the vesting of the award and provide for its termination prior to the effective time of the corporate transaction;
- arrange for the lapse of any reacquisition or repurchase right held by us;
- cancel or arrange for the cancellation of the award in exchange for such cash consideration, if any, as our board of directors may deem appropriate; or
- make a payment equal to the excess of (1) the value of the property the participant would have received upon exercise of the award over (2) the exercise price payable in connection with the award.

The administrator is not obligated to treat all awards, even those that are of the same type, in the same manner.

Under our 2011 Plan, a significant corporate transaction is generally the consummation of (1) a sale or other disposition of all or substantially all of our consolidated assets, (2) a sale or other disposition of at least 90% of our outstanding securities, (3) a merger, consolidation or similar transaction following which we are not the surviving corporation, or (4) a merger, consolidation or similar transaction following which we are the surviving corporation but the shares of our common stock outstanding immediately prior to such transaction are converted or exchanged into other property by virtue of the transaction.

Change in Control. The administrator may provide, in an individual award agreement or in any other written agreement between a participant and us that the award will be subject to additional acceleration of vesting and

exercisability upon or after a change in control. Under our 2011 Plan, a change in control is generally (1) the acquisition by a person or entity of more than 50% of our combined voting power other than by merger, consolidation or similar transaction, (2) a consummated merger, consolidation or similar transaction immediately after which our stockholders do not own more than 50% of the combined voting power of the surviving entity (or its parent company), (3) a consummated sale, lease or exclusive license or other disposition of all or substantially all of our consolidated assets, and (4) certain changes in our board of directors.

Plan Amendment or Termination. Our board of directors may amend, alter, suspend or terminate our 2011 Plan at any time, subject to stockholder approval to the extent required by applicable law. No amendment to our 2011 Plan may impair the rights of any award holder unless mutually agreed otherwise between the award holder and us. As discussed above, we will terminate our 2011 Plan prior to the closing of this offering and no new awards will be granted thereunder following such termination.

401(k) Plan

We maintain a 401(k) plan that provides eligible U.S. employees with an opportunity to save for retirement on a tax-advantaged basis. Eligible employees are able to defer eligible compensation up to certain Code limits, which are updated annually. We have the ability to make matching and discretionary contributions to the 401(k) plan. Currently, we do not make matching contributions or discretionary contributions to the 401(k) plan. The 401(k) plan is intended to be qualified under Section 401(a) of the Code, with the related trust intended to be tax exempt under Section 501(a) of the Code. As a tax-qualified retirement plan, contributions to the 401(k) plan are deductible by us when made, and contributions and earnings on those amounts are not generally taxable to the employees until withdrawn or distributed from the 401(k) plan.

Limitations of Liability and Indemnification Matters

On the closing of this offering, our amended and restated certificate of incorporation will contain provisions that limit the liability of our current and former directors for monetary damages to the fullest extent permitted by Delaware law. Delaware law provides that directors of a corporation will not be personally liable for monetary damages for any breach of fiduciary duties as directors, except liability for:

- any breach of the director's duty of loyalty to the corporation or its stockholders;
- any act or omission not in good faith or that involves intentional misconduct or a knowing violation of law;
- unlawful payments of dividends or unlawful stock repurchases or redemptions; or
- any transaction from which the director derived an improper personal benefit.

Such limitation of liability does not apply to liabilities arising under federal securities laws and does not affect the availability of equitable remedies such as injunctive relief or rescission.

Our amended and restated certificate of incorporation that will be in effect on the closing of this offering will authorize us to indemnify our directors, officers, employees, and other agents to the fullest extent permitted by Delaware law. Our amended and restated bylaws that will be in effect on the closing of this offering will provide that we are required to indemnify our directors and officers to the fullest extent permitted by Delaware law and may indemnify our other employees and agents. Our amended and restated bylaws that will be in effect on the closing of this offering will also provide that, on satisfaction of certain conditions, we will advance expenses incurred by a director or officer in advance of the final disposition of any action or proceeding, and permit us to secure insurance on behalf of any officer, director, employee, or other agent for any liability arising out of his or her actions in that capacity regardless of whether we would otherwise be permitted to indemnify him or her under the provisions of Delaware law. We have entered and expect to continue to enter into agreements to indemnify our directors and executive officers. With certain exceptions, these agreements provide for

indemnification for related expenses, including attorneys' fees, judgments, fines, and settlement amounts incurred by any of these individuals in connection with any action, proceeding, or investigation. We believe that these amended and restated certificate of incorporation and amended and restated bylaw provisions and indemnification agreements are necessary to attract and retain qualified persons as directors and officers. We also maintain customary directors' and officers' liability insurance.

The limitation of liability and indemnification provisions in our amended and restated certificate of incorporation and amended and restated bylaws may discourage stockholders from bringing a lawsuit against our directors 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 other stockholders. Further, a stockholder'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.

Insofar as indemnification for liabilities arising under the Securities Act of 1933, as amended (the "Securities Act"), may be permitted for directors, executive officers, or persons controlling us, 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.

CERTAIN RELATIONSHIPS AND RELATED PARTY TRANSACTIONS

Other than compensation arrangements for our directors and executive officers, which are described elsewhere in this prospectus, below we describe transactions since January 1, 2016 and each currently proposed transaction in which:

- we have been or are to be a participant;
- the amounts involved exceeded or will exceed $120,000; and
- any of our directors, executive officers, or holders of more than 5% of our outstanding capital stock, or any immediate family member of, or person sharing the household with, any of these individuals or entities, had or will have a direct or indirect material interest.

Convertible Promissory Note Financing

In June 2017, our board of directors approved and we sold and issued $12,225,000 principal amount of convertible promissory notes to certain investors, including certain holders of more than 5% of our outstanding capital stock as set forth in the table below. The convertible promissory notes carried an 8% interest rate per annum. The notes were amended with the consent of Lightspeed Venture Partners VIII, L.P. and Abingworth Bioventures V, LP in May 2018 and August 2018. Pursuant to these amendments, in September 2018, the outstanding principal balance of and unpaid accrued interest on the notes converted into an aggregate total of 1,667,997 shares of our Series C redeemable convertible preferred stock at a price per share of $8.052, including a total of 682,207 shares that were issued to certain holders of more than 5% of our outstanding capital stock as set forth in the table below.

Stockholder	Principal Amount of Notes	Number of Conversion Shares
Entities affiliated with Lightspeed Venture Partners(1)(2)	$2,179,000	297,306
Abingworth Bioventures V LP(3)	1,886,500	257,397
MDV IX, L.P., as nominee for itself and MDV ENF IX, L.P.	934,500	127,504

(1) Entities associated with Lightspeed Venture Partners holding our securities whose shares are aggregated for purposes of reporting share ownership information are Lightspeed Venture Partners Select, L.P. and Lightspeed Venture Partners VIII, L.P.

(2) Christopher Schaepe, a member of our board of directors until his resignation on March 21, 2019, was a general partner at Lightspeed Venture Partners at the time of these transactions.

(3) Vincent Miles, Ph.D., a member of our board of directors until his resignation on May 1, 2019, is a general partner at Abingworth Bioventures V LP.

Investor Rights Agreement

We are party to an amended and restated investor rights agreement (the “IRA”) with certain holders of our capital stock, including the holders of more than 5% of our outstanding capital stock, such as Lightspeed Venture Partners VIII, L.P., Lightspeed Venture Partners Select, L.P., Abingworth Bioventures V LP, MDV IX, L.P. and its affiliates, and certain affiliates of The Board of Trustees of the Leland Stanford Junior University. The IRA provides the holders of our redeemable convertible preferred stock with certain registration rights, including the right to demand that we file a registration statement or request that their shares be covered by a registration statement that we are otherwise filing. The IRA also provides these stockholders with information rights, which will terminate on the closing of this offering, and a right of first refusal with regard to certain issuances of our capital stock, which will not apply to the shares issued pursuant to this offering and which will terminate on the closing of this offering. After the closing of this offering, the holders of up to an aggregate of 18,790,983 shares of our common stock (including an aggregate of 127,598 shares issuable upon the exercise of warrants that were

outstanding as of March 31, 2019) will be entitled to rights with respect to the registration of their shares under the Securities Act under this agreement. For a description of these registration rights, see the section titled "Description of Capital Stock—Registration Rights."

Voting Agreement

We are party to an amended and restated voting agreement under which certain holders of our capital stock, including the holders of more than 5% of our outstanding capital stock, such as Lightspeed Venture Partners VIII, L.P., Lightspeed Venture Partners Select, L.P., Abingworth Bioventures V LP, MDV IX, L.P. and its affiliates, and certain affiliates of The Board of Trustees of the Leland Stanford Junior University, have agreed as to the manner in which they will vote their shares of our capital stock on certain matters, including with respect to the election of directors. Upon the closing of this offering, the amended and restated voting agreement will terminate, and none of our stockholders will have any special rights regarding the election or designation of members of our board of directors.

Directed Share Program

At our request, the underwriters have reserved up to 333,333 shares of common stock, or up to 5% of the shares offered by this prospectus, for sale at the initial public offering price through a directed share program to our non-employee directors. The directed share program will not limit the ability of our non-employee directors to purchase more than $120,000 in value of our common stock. We do not currently know the extent to which our non-employee directors 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. For additional information, see the section titled "Underwriters—Directed Share Program."

Indemnification Agreements

Our amended and restated certificate of incorporation that will be in effect on the closing of this offering will contain provisions limiting the liability of directors, and our amended and restated bylaws that will be in effect on the closing of this offering will provide that we will indemnify each of our directors and officers to the fullest extent permitted under Delaware law. Our amended and restated certificate of incorporation and amended and restated bylaws that will be in effect on the closing of this offering will also provide our board of directors with discretion to indemnify our employees and other agents when determined appropriate by the board.

In addition, we have entered into an indemnification agreement with each of our directors and executive officers, which requires us to indemnify them. For more information regarding these agreements, see the section titled "Executive Compensation—Limitations of Liability and Indemnification Matters."

Policies and Procedures for Related Person Transactions

Prior to the closing of this offering, our board of directors will adopt a related person transaction policy setting forth the policies and procedures for the identification, review, and approval or ratification of related person transactions. This policy covers, with certain exceptions set forth in Item 404 of Regulation S-K under the Securities Act, any transaction, arrangement, or relationship, or any series of similar transactions, arrangements, or relationships, in which we and a related person were or will be participants and the amount involved exceeds $120,000, including purchases of goods or services by or from the related person or entities in which the related person has a material interest, indebtedness, and guarantees of indebtedness. In reviewing and approving any such transactions, our audit committee will consider all relevant facts and circumstances as appropriate, such as the purpose of the transaction, the availability of other sources of comparable products or services, whether the transaction is on terms comparable to those that could be obtained in an arm's length transaction, management's recommendation with respect to the proposed related person transaction, and the extent of the related person's interest in the transaction.

PRINCIPAL STOCKHOLDERS

The following table sets forth information with respect to the beneficial ownership of our capital stock as of March 31, 2019, as adjusted to reflect the sale of our common stock offered by us in this offering assuming no exercise of the underwriters' option to purchase additional shares, for:

- each of our named executive officers;
- each of our directors;
- all of our executive officers and directors as a group; and
- each person or group of affiliated persons known by us to beneficially own more than 5% of our common stock.

We have determined beneficial ownership in accordance with the rules and regulations of the SEC, and the information is not necessarily indicative of beneficial ownership for any other purpose. Except as indicated by the footnotes below, we believe, based on information furnished to us, that the persons and entities named in the table below have sole voting and sole investment power with respect to all shares that they beneficially own, subject to applicable community property laws.

Applicable percentage ownership before the offering is based on 21,829,701 shares of common stock outstanding as of March 31, 2019, assuming the automatic conversion of all outstanding shares of our redeemable convertible preferred stock into shares of common stock upon the closing of this offering and assuming the exercise of a warrant to purchase 188,643 shares of our common stock. Applicable percentage ownership after the offering is based on 28,496,368 shares of common stock outstanding immediately after the closing of this offering, assuming no exercise by the underwriters of their over-allotment option and excluding any potential purchases pursuant to the directed share program in this offering. In computing the number of shares beneficially owned by a person and the percentage ownership of such person, we deemed to be outstanding all shares subject to options held by the person that are currently exercisable, or exercisable within 60 days of March 31, 2019. However, except as described above, we did not deem such shares outstanding for the purpose of computing the percentage ownership of any other person.

Unless otherwise indicated, the address of each beneficial owner listed below is c/o Personalis, Inc., 1330 O'Brien Drive, Menlo Park, California 94025. We believe, based on information provided to us, that each of the stockholders listed below has sole voting and investment power with respect to the shares beneficially owned by the stockholder unless noted otherwise, subject to community property laws where applicable.

	Shares Beneficially Owned Prior to Offering		Shares Beneficially Owned After Offering	
Name of Beneficial Owner	**Number**	**Percentage**	**Number**	**Percentage**
5% Stockholders				
Entities affiliated with Lightspeed Venture Partners(1)	6,076,494	27.8%	6,076,494	21.3%
Abingworth Bioventures V LP(2)	5,449,294	25.0%	5,449,294	19.1%
Entities affiliated with MDV(3)	2,605,838	11.9%	2,605,838	9.1%
Entities affiliated with The Board of Trustees of the Leland Stanford Junior University(4)	1,427,219	6.5%	1,427,219	5.0%
Directors and Named Executive Officers				
John West(5)	1,615,269	7.0%	1,615,269	5.5%
Richard Chen, M.D., M.S.(6)	439,301	2.0%	439,301	1.5%
Clinton Musil(7)	51,167	*	51,167	*
Patrick Balthrop(8)	47,915	*	47,915	*
A. Blaine Bowman	—	—	—	—
Alan Colowick, M.D.	—	—	—	—

Name of Beneficial Owner	Shares Beneficially Owned Prior to Offering		Shares Beneficially Owned After Offering	
	Number	Percentage	Number	Percentage
Kenneth Ludlum(9)	49,999	*	49,999	*
Jonathan MacQuitty, Ph.D.(10)	75,000	*	75,000	*
Paul Ricci(11)	125,000	*	125,000	*
All directors and executive officers as a group (10 persons)(12)	2,403,651	10.2%	2,403,651	7.9%

* Represents beneficial ownership of less than 1%.

(1) Consists of (i) 4,117,768 shares held of record by Lightspeed Venture Partners VIII, L.P. (“Lightspeed VIII”) and (ii) 1,958,726 shares held of record by Lightspeed Venture Partners Select, L.P. (“Lightspeed Select”). Lightspeed General Partner VIII, L.P. (“Lightspeed GP”) is the general partner of Lightspeed VIII. Lightspeed Ultimate General Partner VIII, Ltd. (“Lightspeed UGP”) is the general partner of Lightspeed GP. Barry Eggers, Ravi Mhatre, and Peter Nieh are the directors of Lightspeed UGP and share voting and dispositive power with respect to the shares held by Lightspeed VIII. Lightspeed General Partner Select, L.P. (“Lightspeed Select GP”) is the general partner of Lightspeed Select. Lightspeed Ultimate General Partner Select, Ltd. (“Lightspeed Select UGP”) is the general partner of Lightspeed Select GP. Barry Eggers, Jeremy Liew, Ravi Mhatre, and Peter Nieh are the directors of Lightspeed Select UGP and share voting and dispositive power with respect to the shares held by Lightspeed Select GP. The address for these entities is 2200 Sand Hill Road, Menlo Park, California 94025.

(2) Consists of (i) 5,260,651 shares held of record by Abingworth Bioventures V, LP (“ABV V”) and Abingworth LLP (“ALLP”), the investment manager of ABV V, and (ii) 188,643 shares subject to a warrant exercisable within 60 days of March 31, 2019. Abingworth Bioventures V GP LP, a Scottish limited partnership (“ABV GP”), serves as the general partner of ABV V. Abingworth Bioventures V GP Limited, an English company (“ABV GP Limited”), serves as the general partner of ABV GP. ABV GP has delegated to ALLP all investment and dispositive power over the securities held by ABV V. An investment committee of Abingworth, composed of Timothy J. Haines, Genghis Lloyd-Harris, Kurt von Emster, Shelley Chu, and Stephen W. Bunting, approves investment and voting decisions by a majority vote, and no individual member has the sole control or voting power over the securities held by ABV V. Each of ABV GP, ABV GP Limited, ALLP, Timothy J. Haines, Genghis Lloyd-Harris, Kurt von Emster, Shelley Chu, and Stephen W. Bunting disclaims beneficial ownership of the securities held by ABV V. The address for these entities is 38 Jermyn Street, London SW1Y 6DN, United Kingdom.

(3) Consists of (i) 2,458,209 shares held of record by MDV IX, L.P. (“MDV IX”), (ii) 20,125 shares held of record by MDV ENF IX, L.P. (“ENF IX”), and (iii) 127,504 shares held of record by MDV IX, L.P., as nominee for MDV IX, L.P. and MDV ENF IX, L.P. (“IX Funds”). Ninth MDV, LLC is the general partner of each of MDV IX, ENF IX, and IX Funds. Jonathan Feiber and William Ericson are the managing members of Ninth MDV, LLC, and either are deemed to have sole voting and dispositive power with respect to the shares held by MDV IX, ENF IX, and IX Funds. The address for these entities is 777 Mariners Island Boulevard, Suite 550, San Mateo, California 94404.

(4) Consists of (i) 12,631 shares held of record by The Board of Trustees of the Leland Stanford Junior University (DAPER I) (“DAPER”), (ii) 98,883 shares held of record by The Board of Trustees of the Leland Stanford Junior University (OTL) (“OTL”), (iii) 1,303,074 shares held of record by The Board of Trustees of the Leland Stanford Junior University (PVF) (“PVF”), and (iv) 12,631 shares held of record by The Board of Trustees of the Leland Stanford Junior University (SBST) (“SBST”). The Board of Trustees of the Leland Stanford Junior University is the sole beneficiary of the shares held by DAPER, OTL, PVF and SBST. The address for these entities is 635 Knight Way, Stanford, California 94305.

(5) Consists of (i) 500,000 shares held of record by Mr. West and (ii) 1,115,269 shares subject to options exercisable within 60 days of March 31, 2019.

(6) Consists of (i) 25,000 shares held of record by Dr. Chen and (ii) 414,301 shares subject to options exercisable within 60 days of March 31, 2019.

(7) Consists of 51,167 shares subject to an option, which shares vest and become exercisable upon the closing of this offering, which will occur within 60 days of March 31, 2019.
(8) Consists of (i) 13,541 shares held of record by Patrick Balthrop and Mariteres Balthrop Trust, for which Mr. Balthrop is a trustee, and (ii) 34,374 shares subject to options exercisable within 60 days of March 31, 2019.
(9) Consists of (i) 45,833 shares held of record by Mr. Ludlum and (ii) 4,166 shares subject to options exercisable within 60 days of March 31, 2019.
(10) Consists of 75,000 shares subject to options exercisable within 60 days of March 31, 2019.
(11) Consists of 125,000 shares subject to options exercisable within 60 days of March 31, 2019.
(12) Consists of (i) 584,374 shares held by our current directors and executive officers, and (ii) 1,819,277 shares subject to options exercisable within 60 days of March 31, 2019.

DESCRIPTION OF CAPITAL STOCK

General

The following is a summary of the rights of our common and preferred stock and some of the provisions of our amended and restated certificate of incorporation and amended and restated bylaws, which will each become effective upon the closing of this offering, the IRA, and relevant provisions of the Delaware General Corporation Law (the "DGCL"). The descriptions herein are qualified in their entirety by our amended and restated certificate of incorporation, amended and restated bylaws, and the IRA, copies of which have been filed as exhibits to the registration statement of which this prospectus is a part, as well as the relevant provisions of the DGCL.

Upon the closing of this offering, our authorized capital stock will consist of 210,000,000 shares, all with a par value of $0.0001 per share, of which:

- 200,000,000 shares are designated as common stock; and
- 10,000,000 shares are designated as preferred stock.

Common Stock

As of March 31, 2019, there were 21,829,701 shares of our common stock outstanding and held of record by 184 stockholders, assuming the automatic conversion of all outstanding shares of our preferred stock into shares of common stock, which will automatically occur immediately prior to the closing of this offering.

Holders of our common stock are entitled to one vote for each share held on all matters submitted to a vote of stockholders, including the election of directors, and do not have cumulative voting rights. Accordingly, the holders of a majority of the outstanding shares of common stock entitled to vote in any election of directors can elect all of the directors standing for election, if they so choose, other than any directors that holders of any preferred stock we may issue may be entitled to elect. Subject to preferences that may be applicable to any then-outstanding preferred stock, holders of common stock are entitled to receive ratably those dividends, if any, as may be declared by the board of directors out of legally available funds. In the event of our liquidation, dissolution, or winding up, the holders of common stock will be entitled to share ratably in the assets legally available for distribution to stockholders after the payment of or provision for all of our debts and other liabilities, subject to the prior rights of any preferred stock then-outstanding. Holders of common stock have no preemptive or conversion rights or other subscription rights and there are no redemption or sinking funds provisions applicable to the common stock. All outstanding shares of common stock are, and the common stock to be outstanding upon the closing of this offering will be, duly authorized, validly issued, fully paid, and nonassessable. All authorized but unissued shares of our common stock will be available for issuance by our board of directors without any further stockholder action, except as required by the listing standards of Nasdaq. The rights, preferences, and privileges of holders of common stock are subject to and may be adversely affected by the rights of the holders of shares of any series of preferred stock that we may designate and issue in the future.

Preferred Stock

As of March 31, 2019, there were 18,474,742 shares of redeemable convertible preferred stock outstanding. Immediately upon the closing of this offering, each outstanding share of redeemable convertible preferred stock will convert into one share of common stock, and no shares of preferred stock will be outstanding.

Upon the closing of this offering, our board of directors may, without further action by our stockholders, fix the rights, preferences, privileges and restrictions of up to an aggregate of 10,000,000 shares of redeemable convertible preferred stock in one or more series and authorize their issuance. These rights, preferences, and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation

preferences, sinking fund terms, and the number of shares constituting any series or the designation of such series, any or all of which may be greater than the rights of our common stock. The issuance of our redeemable convertible preferred stock could adversely affect the voting power of holders of our common stock, and the likelihood that such holders will receive dividend payments and payments upon liquidation. In addition, the issuance of preferred stock could have the effect of delaying, deferring, or preventing a change of control or other corporate action.

Options

As of March 31, 2019, we had outstanding options under our equity compensation plans to purchase an aggregate of 4,381,884 shares of our common stock with a weighted-average exercise price of $3.62 per share.

Warrants

As of March 31, 2019, we had two outstanding warrants to purchase an aggregate of up to 254,145 shares of our common stock with a weighted-average exercise price of $2.39 per share.

As of March 31, 2019, we had two outstanding warrants to purchase an aggregate of up to 84,585 shares of our preferred stock with a weighted-average exercise price of $7.13 per share. One such warrant provides for automatic, cashless exercise prior to its expiration date on September 25, 2024 under certain circumstances. Unless earlier exercised, the other warrant will expire upon the later of (i) June 28, 2024 or (ii) five years after the closing of this offering. Upon the closing of this offering and unless earlier exercised, both of these warrants will together become exercisable for up to 84,585 shares of our common stock with a weighted-average exercise price of $7.13 per share.

Registration Rights

We are party to an IRA that provides that certain stockholders, including certain holders of at least 5% of our outstanding capital stock, have certain registration rights as set forth below. The registration of shares of our common stock by the exercise of registration rights described below would enable the holders to sell these shares without restriction under the Securities Act when the applicable registration statement is declared effective. We will pay the registration expenses, other than underwriting discounts and commissions, of the shares registered pursuant to the demand, piggyback, and Form S-3 registration rights described below.

Generally, in an underwritten offering, the managing underwriter, if any, has the right, subject to specified conditions, to limit the number of shares such holders may include. The demand, piggyback, and Form S-3 registration rights described below will expire three years after the closing of this offering, of which this prospectus is a part, or with respect to any particular stockholder, at such time after the closing of this offering that such stockholder holds less than 1% of our outstanding common stock and such stockholder can sell all of its shares entitled to registration rights under Rule 144 of the Securities Act during any 90-day period.

Demand Registration Rights

The holders of up to an aggregate of 18,725,481 shares of our common stock (including 62,096 shares issuable upon the exercise of a warrant that was outstanding as of March 31, 2019) will be entitled to certain demand registration rights. At any time beginning 180 days after the closing of this offering, the holders of a majority of these shares may request that we register all or a portion of their shares. We are obligated to effect only two such registrations. Such request for registration must cover shares with an anticipated aggregate offering price, net of underwriting discounts and commissions, of at least $20 million.

Piggyback Registration Rights

In connection with this offering, the holders of an aggregate of 18,663,385 shares of our common stock were entitled to, and the necessary percentage of holders waived, their rights to notice of this offering and to

include their shares of registrable securities in this offering. After this offering, in the event that we propose to register any of our securities under the Securities Act, either for our own account or for the account of other security holders, the holders of up to an aggregate of 18,790,983 shares of our common stock (including an aggregate of 127,598 shares issuable upon the exercise of warrants that were outstanding as of March 31, 2019) will be entitled to certain piggyback registration rights allowing the holder to include their shares in such registration, subject to certain marketing and other limitations. As a result, whenever we propose to file a registration statement under the Securities Act, other than with respect to (i) a registration statement relating to any employee benefit plans, (ii) a registration relating to a corporate reorganization or other Rule 145 transaction, (iii) a registration relating to stock issued upon conversion of debt securities, or (iv) a registration on any registration form that does not permit secondary sales, the holders of these shares are entitled to notice of the registration and have the right to include their shares in the registration, subject to limitations that the underwriters may impose on the number of shares included in the offering.

Form S-3 Registration Rights

The holders of up to an aggregate of 18,725,481 shares of our common stock (including 62,096 shares issuable upon the exercise of a warrant that was outstanding as of March 31, 2019) will be entitled to certain Form S-3 registration rights. The holders of at least 20% of these shares can make a request that we register their shares on Form S-3 if we are qualified to file a registration statement on Form S-3 and if the reasonably anticipated aggregate gross proceeds of the shares offered would equal or exceed $1 million. We will not be required to effect more than two registrations on Form S-3 within any 12-month period.

Anti-Takeover Effects of Delaware Law and Our Certificate of Incorporation and Bylaws

Some provisions of Delaware law, our amended and restated certificate of incorporation, and our amended and restated bylaws contain or will contain provisions that could make the following transactions more difficult: an acquisition of us by means of a tender offer; an acquisition of us by means of a proxy contest or otherwise; or the removal of our incumbent officers and directors. It is possible that these provisions could make it more difficult to accomplish or could deter transactions that stockholders may otherwise consider to be in their best interest or in our best interests, including transactions which provide for payment of a premium over the market price for our shares.

These provisions, summarized below, are intended to discourage coercive takeover practices and inadequate takeover bids. These provisions are also designed to encourage persons seeking to acquire control of us to first negotiate with our board of directors. We believe that the benefits of the increased protection of our potential ability to negotiate with the proponent of an unfriendly or unsolicited proposal to acquire or restructure us outweigh the disadvantages of discouraging these proposals because negotiation of these proposals could result in an improvement of their terms.

Stockholder Meetings

Our amended and restated bylaws will provide that a special meeting of stockholders may be called only by our chairman of the board, chief executive officer or president, or by a resolution adopted by a majority of our board of directors.

Requirements for Advance Notification of Stockholder Nominations and Proposals

Our amended and restated bylaws will establish advance notice procedures with respect to stockholder proposals to be brought before a stockholder meeting and the nomination of candidates for election as directors, other than nominations made by or at the direction of the board of directors or a committee of the board of directors.

Elimination of Stockholder Action by Written Consent

Our amended and restated certificate of incorporation and amended and restated bylaws will eliminate the right of stockholders to act by written consent without a meeting.

Staggered Board

Our board of directors will be divided into three classes. The directors in each class will serve for a three-year term, one class being elected each year by our stockholders. For more information on the classified board, see the section titled "Management—Composition of Our Board of Directors." This system of electing and removing directors may tend to discourage a third party from making a tender offer or otherwise attempting to obtain control of us, because it generally makes it more difficult for stockholders to replace a majority of the directors.

Removal of Directors

Our amended and restated certificate of incorporation will provide that no member of our board of directors may be removed from office by our stockholders except for cause and, in addition to any other vote required by law, upon the approval of not less than two-thirds of the total voting power of all of our outstanding voting stock then entitled to vote in the election of directors.

Stockholders Not Entitled to Cumulative Voting

Our amended and restated certificate of incorporation will not permit stockholders to cumulate their votes in the election of directors. Accordingly, the holders of a majority of the outstanding shares of our common stock entitled to vote in any election of directors can elect all of the directors standing for election, if they choose, other than any directors that holders of our preferred stock may be entitled to elect.

Delaware Anti-Takeover Statute

We are subject to Section 203 of the DGCL, which prohibits persons deemed to be "interested stockholders" from engaging in a "business combination" with a publicly held Delaware corporation for three years following the date these persons become interested stockholders unless the business combination is, or the transaction in which the person became an interested stockholder was, approved in a prescribed manner or another prescribed exception applies. Generally, an "interested stockholder" is a person who, together with affiliates and associates, owns, or within three years prior to the determination of interested stockholder status did own, 15% or more of a corporation's voting stock. Generally, a "business combination" includes a merger, asset or stock sale, or other transaction resulting in a financial benefit to the interested stockholder. The existence of this provision may have an anti-takeover effect with respect to transactions not approved in advance by the board of directors.

Choice of Forum

Our amended and restated certificate of incorporation will provide that, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware will be the exclusive forum for the following types of actions or proceedings under Delaware statutory or common law: (1) any derivative action or proceeding brought on our behalf; (2) any action asserting a claim of breach of a fiduciary duty or other wrongdoing by any of our directors, officers, employees, or agents to us or our stockholders; (3) any action asserting a claim against us arising pursuant to any provision of the DGCL or our certificate of incorporation or bylaws; (4) any action to interpret, apply, enforce or determine the validity of our certificate of incorporation or bylaws; or (5) any action asserting a claim governed by the internal affairs doctrine. This provision would not apply to suits brought to enforce a duty or liability created by the Exchange Act or any other claim for which the U.S. federal courts have exclusive jurisdiction. Our amended and restated certificate of incorporation further

provides 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 and contingent upon a final adjudication in the State of Delaware of the enforceability of such exclusive forum provision. Our amended and restated certificate of incorporation will also provide that any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock will be deemed to have notice of and to have consented to these choice of forum provisions. It is possible that a court of law could rule that the choice of forum provisions to be contained in our amended and restated certificate of incorporation are inapplicable or unenforceable if they are challenged in a proceeding or otherwise.

Amendment of Charter Provisions

The amendment of any of the above provisions, except for the provision making it possible for our board of directors to issue preferred stock, would require approval by holders of at least two-thirds of the total voting power of all of our outstanding voting stock.

The provisions of Delaware law, our amended and restated certificate of incorporation, and our amended and restated bylaws could have the effect of discouraging others from attempting hostile takeovers and, as a consequence, they may also inhibit temporary fluctuations in the market price of our common stock that often result from actual or rumored hostile takeover attempts. These provisions may also have the effect of preventing changes in the composition of our board and management. It is possible that these provisions could make it more difficult to accomplish transactions that stockholders may otherwise deem to be in their best interests.

Transfer Agent and Registrar

The transfer agent and registrar for our common stock upon the closing of this offering will be Computershare Trust Company, N.A.

Exchange Listing

Our common stock is currently not listed on any securities exchange. We have applied to list our common stock on The Nasdaq Global Market (“Nasdaq”) under the symbol “PSNL.”

SHARES ELIGIBLE FOR FUTURE SALE

Prior to this offering, there has been no public market for our common stock. Future sales of substantial amounts of common stock in the public market, or the perception that such sales may occur, could adversely affect the market price of our common stock. Although we have applied to list our common stock on The Nasdaq Global Market, we cannot assure you that there will be an active public market for our common stock.

Following the closing of this offering, based on the number of shares of our common stock outstanding as of March 31, 2019 and assuming (1) the issuance of shares of common stock in this offering, (2) the conversion of all outstanding shares of our redeemable convertible preferred stock into shares of our common stock, which will automatically occur immediately prior to the closing of the offering, (3) the exercise of a warrant to purchase 188,643 shares of our common stock, and (4) no exercise of the underwriters' over-allotment option, we will have an aggregate of approximately 28,496,368 shares of common stock outstanding.

Of these shares, all shares of common stock sold in this offering will be freely tradable without restriction or further registration under the Securities Act, except for (i) any shares of common stock purchased by our "affiliates," as that term is defined in Rule 144 under the Securities Act and (ii) any shares purchased in our directed share program, which will be subject to the lock-up agreements described below. Shares purchased by our affiliates would be subject to the Rule 144 resale restrictions described below, other than the holding period requirement.

The remaining shares of common stock outstanding after this offering will be "restricted securities," as that term is defined in Rule 144 under the Securities Act. These restricted securities are eligible for public sale only if they are registered under the Securities Act or if they qualify for an exemption from registration under Rule 144 or Rule 701 under the Securities Act, each of which is summarized below. We expect that all of these shares will be subject to a 180-day lock-up period under the lock-up and market stand-off agreements described below.

We may issue shares of common stock from time to time as consideration for future acquisitions, investments, or other corporate purposes. In the event any such acquisition, investment, or other transaction is significant, the number of shares of common stock that we may issue may also be significant. We may also grant registration rights covering those shares of common stock issued in connection with any such acquisition, investment, or other transaction.

In addition, shares of common stock that are either subject to outstanding options or warrants or reserved for future issuance under our equity incentive plans will become eligible for sale in the public market to the extent permitted by the provisions of various vesting schedules, the lock-up agreements described below, and Rules 144 and 701 under the Securities Act.

Lock-Up Agreements

We, along with our directors, executive officers, and substantially all of our other stockholders and optionholders, have agreed with the underwriters that for a period of 180 days, after the date of this prospectus, subject to specified exceptions as detailed further in "Underwriters" below, we or they will not, except with the prior written consent of the representatives, offer, pledge, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to sale of, or otherwise dispose of or transfer any shares of common stock or any securities convertible into or exercisable or exchangeable for shares of common stock, request or demand that we file a registration statement related to our common stock, or enter into any swap or other agreement that transfers to another, in whole or in part, directly or indirectly, the economic consequence of ownership of the common stock. All of our stockholders are subject to a market stand-off agreement with us which imposes similar restrictions.

Upon expiration of the lock-up period, certain of our stockholders will have the right to require us to register their shares under the Securities Act. See "—Registration Rights" below and the section titled "Description of Capital Stock—Registration Rights."

Upon the expiration of the lock-up period, substantially all of the shares subject to such lock-up restrictions will become eligible for sale, subject to the limitations discussed above.

Rule 144

In general, under Rule 144 as currently in effect, once we have been subject to public company reporting requirements of Section 13 or Section 15(d) of the Exchange Act for at least 90 days, an eligible stockholder is entitled to sell such shares without complying with the manner of sale, volume limitation, or notice provisions of Rule 144, subject to compliance with the public information requirements of Rule 144. To be an eligible stockholder under Rule 144, such stockholder must not be deemed to have been one of our affiliates for purposes of the Securities Act at any time during the 90 days preceding a sale and must have beneficially owned the shares proposed to be sold for at least six months, including the holding period of any prior owner other than our affiliates. If such a person has beneficially owned the shares proposed to be sold for at least one year, including the holding period of any prior owner other than our affiliates, then such person is entitled to sell such shares without complying with any of the requirements of Rule 144, subject to the expiration of the lock-up agreements described above.

In general, under Rule 144, as currently in effect, our affiliates or persons selling shares on behalf of our affiliates are entitled to sell shares on expiration of the lock-up agreements described above. Beginning 90 days after the date of this prospectus, within any three-month period, such stockholders may sell a number of shares that does not exceed the greater of:

- 1% of the number of shares of our common stock then outstanding, which will equal approximately 284,964 shares immediately after this offering; or
- the average weekly trading volume in our common stock on Nasdaq during the four calendar weeks preceding the filing of a notice on Form 144 with respect to such sale.

Sales under Rule 144 by our affiliates or persons selling shares on behalf of our affiliates are also subject to certain manner of sale provisions and notice requirements and to the availability of current public information about us.

Rule 701

Rule 701 generally allows a stockholder who was issued shares under a written compensatory plan or contract and who is not deemed to have been an affiliate of our company during the immediately preceding 90 days, to sell these shares in reliance on Rule 144, but without being required to comply with the public information, holding period, volume limitation, or notice provisions of Rule 144. Rule 701 also permits affiliates of our company to sell their Rule 701 shares under Rule 144 without complying with the holding period requirements of Rule 144. All holders of Rule 701 shares, however, are required by that rule to wait until 90 days after the date of this prospectus before selling those shares under Rule 701, subject to the expiration of the lock-up agreements described above.

Form S-8 Registration Statement

We intend to file one or more registration statements on Form S-8 under the Securities Act to register all shares of common stock subject to outstanding stock options and common stock issued or issuable under the 2011 Plan, the 2019 Plan, and the ESPP. We expect to file the registration statement covering shares offered pursuant to these stock plans shortly after the date of this prospectus, permitting the resale of such shares by non-affiliates in the public market without restriction under the Securities Act and the sale by affiliates in the public market subject to compliance with the resale provisions of Rule 144.

Registration Rights

As of March 31, 2019, holders of up to an aggregate of 18,790,983 shares of our common stock, which includes all of the shares of common stock issuable upon the automatic conversion of our redeemable convertible preferred stock immediately prior to the closing of this offering, or their transferees, and the shares issuable upon the exercise of warrants to purchase up to an aggregate of 316,241 shares of our common stock (on an as-converted basis), will be entitled to various rights with respect to the registration of these shares under the Securities Act upon the closing of this offering and the expiration of lock-up agreements. 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, except for shares purchased by affiliates. See the section titled “Description of Capital Stock—Registration Rights” for additional information. Shares covered by a registration statement will be eligible for sale in the public market upon the expiration or release from the terms of the lock-up agreement.

MATERIAL U.S. FEDERAL INCOME TAX CONSEQUENCES TO NON-U.S. HOLDERS OF OUR COMMON STOCK

The following summary describes the material U.S. federal income tax consequences of the acquisition, ownership, and disposition of our common stock acquired in this offering by Non-U.S. Holders (as defined below). This discussion is not a complete analysis of all potential U.S. federal income tax consequences relating thereto, and does not deal with foreign, state, and local consequences that may be relevant to Non-U.S. Holders in light of their particular circumstances, nor does it address U.S. federal tax consequences (such as gift and estate taxes) other than income taxes. Special rules different from those described below may apply to certain Non-U.S. Holders that are subject to special treatment under the Internal Revenue Code of 1986, as amended (the "Code"), such as financial institutions, insurance companies, tax-exempt organizations, broker-dealers and traders in securities, U.S. expatriates, "controlled foreign corporations," "passive foreign investment companies," corporations that accumulate earnings to avoid U.S. federal income tax, corporations organized outside of the United States, any state thereof or the District of Columbia that are nonetheless treated as U.S. taxpayers for U.S. federal income tax purposes, persons that hold our common stock as part of a "straddle," "hedge," "conversion transaction," "synthetic security" or integrated investment or other risk reduction strategy, persons who acquire our common stock through the exercise of an option or otherwise as compensation, persons subject to the alternative minimum tax or federal Medicare contribution tax on net investment income, persons subject to special tax accounting rules under Section 451(b) of the Code, "qualified foreign pension funds" as defined in Section 897(l)(2) of the Code and entities all of the interests of which are held by qualified foreign pension funds, partnerships and other pass-through entities or arrangements, and investors in such pass-through entities or arrangements. Such Non-U.S. Holders are urged to consult their own tax advisors to determine the U.S. federal, state, local, and other tax consequences that may be relevant to them. Furthermore, the discussion below is based upon the provisions of the Code, and Treasury Regulations, rulings, and judicial decisions thereunder as of the date hereof, and such authorities may be repealed, revoked, or modified, perhaps retroactively, so as to result in U.S. federal income tax consequences different from those discussed below. We have not requested a ruling from the U.S. Internal Revenue Service (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 will agree with such statements and conclusions. This discussion assumes that the Non-U.S. Holder holds our common stock as a "capital asset" within the meaning of Section 1221 of the Code (generally, property held for investment).

This discussion is for informational purposes only and is not tax advice. Persons considering the purchase of our common stock pursuant to this offering should consult their own tax advisors concerning the U.S. federal income, estate, and other tax consequences of acquiring, owning, and disposing of our common stock in light of their particular situations as well as any consequences arising under the laws of any other taxing jurisdiction, including any state, local, or foreign tax consequences.

For the purposes of this discussion, a "Non-U.S. Holder" is, for U.S. federal income tax purposes, a beneficial owner of common stock that is neither a U.S. Holder, nor a partnership (or other entity treated as a partnership for U.S. federal income tax purposes regardless of its place of organization or formation). A "U.S. Holder" means a beneficial owner of our common stock that is for U.S. federal income tax purposes any of the following:

- an individual who is a citizen or resident of the United States;
- a corporation or other entity treated as a corporation for U.S. federal income tax purposes created or organized in or 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 taxation regardless of its source; or
- a trust if it (1) is subject to the primary supervision of a court within the United States and one or more U.S. persons have the authority to control all substantial decisions of the trust or (2) has a valid election in effect under applicable U.S. Treasury Regulations to be treated as a U.S. person.

Distributions

Distributions, if any, made on our common stock to a Non-U.S. Holder to the extent made out of our current or accumulated earnings and profits (as determined under U.S. federal income tax principles) generally will constitute dividends for U.S. tax purposes and will be subject to withholding tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty, subject to the discussions below regarding effectively connected income, backup withholding, and foreign accounts. To obtain a reduced rate of withholding under a treaty, a Non-U.S. Holder generally will be required to provide us with a properly executed IRS Form W-8BEN (in the case of individuals) or IRS Form W-8BEN-E (in the case of entities), or other appropriate form, certifying the Non-U.S. Holder's entitlement to benefits under that treaty. This certification must be provided to us or our paying agent prior to the payment of dividends and must be updated periodically. In the case of a Non-U.S. Holder that is an entity, Treasury Regulations and the relevant tax treaty provide rules to determine whether, for purposes of determining the applicability of a tax treaty, dividends will be treated as paid to the entity or to those holding an interest in that entity. If a Non-U.S. Holder holds stock through a financial institution or other agent acting on the holder's behalf, the holder will be required to provide appropriate documentation to such agent. The holder's agent will then be required to provide certification to us or our paying agent, either directly or through other intermediaries. If you are eligible for a reduced rate of U.S. federal withholding tax under an income tax treaty and you do not timely file the required certification, you may be able to obtain a refund or credit of any excess amounts withheld by timely filing an appropriate claim for a refund with the IRS.

We generally are not required to withhold tax on dividends paid to a Non-U.S. Holder that are effectively connected with the Non-U.S. Holder's conduct of a trade or business within the United States (and, if required by an applicable income tax treaty, are attributable to a permanent establishment or fixed base that such holder maintains in the United States) if a properly executed IRS Form W-8ECI, stating that the dividends are so connected, is furnished to us (or, if stock is held through a financial institution or other agent, to such agent). In general, such effectively connected dividends will be subject to U.S. federal income tax, on a net income basis at the regular rates applicable to U.S. residents. A corporate Non-U.S. Holder receiving effectively connected dividends may also be subject to an additional "branch profits tax," which is imposed, under certain circumstances, at a rate of 30% (or such lower rate as may be specified by an applicable treaty) on the corporate Non-U.S. Holder's effectively connected earnings and profits, subject to certain adjustments. Non-U.S. Holders should consult their tax advisors regarding any applicable income tax treaties that may provide for different rules.

To the extent distributions on our common stock, if any, exceed our current and accumulated earnings and profits, they will first reduce the Non-U.S. Holder's adjusted basis in our common stock, but not below zero, and then will be treated as gain to the extent of any excess amount distributed, and taxed in the same manner as gain realized from a sale or other disposition of common stock as described in the next section.

Gain on Disposition of Our Common Stock

Subject to the discussions below regarding backup withholding and foreign accounts, a Non-U.S. Holder generally will not be subject to U.S. federal income tax with respect to gain realized on a sale or other disposition of our common stock unless (a) the gain is effectively connected with a trade or business of such holder in the United States (and, if required by an applicable income tax treaty, is attributable to a permanent establishment or fixed base that such holder maintains in the United States), (b) the Non-U.S. Holder is a nonresident alien individual and is present in the United States for 183 or more days in the taxable year of the disposition and certain other conditions are met, or (c) we are or have been a "United States real property holding corporation" within the meaning of Code Section 897(c)(2) at any time within the shorter of the five-year period preceding such disposition or such holder's holding period. In general, we would be a United States real property holding corporation if our interests in U.S. real estate comprise (by fair market value) at least half of our business assets. We believe that we have not been and we are not, and do not anticipate becoming, a United States real property holding corporation. Even if we are treated as a United States real property holding corporation, gain realized by a Non-U.S. Holder on a disposition of our common stock will not be subject to U.S. federal income

tax so long as (1) the Non-U.S. Holder owned, directly, indirectly and constructively, no more than 5% of our common stock at all times within the shorter of (i) the five-year period preceding the disposition or (ii) the holder's holding period and (2) our common stock is regularly traded on an established securities market. There can be no assurance that our common stock will continue to qualify as regularly traded on an established securities market. If any gain on your disposition is taxable because we are a United States real property holding corporation and your ownership of our common stock exceeds 5%, you will be taxed on such disposition generally in the manner as gain that is effectively connected with the conduct of a U.S. trade or business (subject to the provisions under an applicable income tax treaty), except that the branch profits tax generally will not apply.

If you are a Non-U.S. Holder described in (a) above, you will be required to pay tax on the net gain derived from the sale at regular U.S. federal income tax rates, and corporate Non-U.S. Holders described in (a) above may be subject to the additional branch profits tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty. Gain described in (b) above will be subject to U.S. federal income tax at a flat 30% rate or such lower rate as may be specified by an applicable income tax treaty, which gain may be offset by certain U.S.-source capital losses (even though you are 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.

Information Reporting Requirements and Backup Withholding

Generally, we must report information to the IRS with respect to any dividends we pay on our common stock (even if the payments are exempt from withholding), including the amount of any such dividends, the name and address of the recipient, and the amount, if any, of tax withheld. A similar report is sent to the holder to whom any such dividends are paid. Pursuant to tax treaties or certain other agreements, the IRS may make its reports available to tax authorities in the recipient's country of residence.

Dividends paid by us (or our paying agents) to a Non-U.S. Holder may also be subject to U.S. backup withholding. U.S. backup withholding generally will not apply to a Non-U.S. Holder who provides a properly executed IRS Form W-8BEN, IRS Form W-8BEN-E, or IRS Form W-ECI, or otherwise establishes an exemption. Notwithstanding the foregoing, 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.

U.S. information reporting and backup withholding requirements generally will apply to the proceeds of a disposition of our common stock effected by or through a U.S. office of any broker, U.S. or foreign, except that information reporting and such requirements may be avoided if the holder provides a properly executed IRS Form W-8BEN or IRS Form W-8BEN-E or otherwise meets documentary evidence requirements for establishing non-U.S. person status or otherwise establishes an exemption. Generally, U.S. information reporting and backup withholding requirements will not apply to a payment of disposition proceeds to a Non-U.S. Holder where the transaction is effected outside the United States through a non-U.S. office of a non-U.S. broker. Information reporting and backup withholding requirements may, however, apply to a payment of disposition proceeds if the broker has actual knowledge, or reason to know, that the holder is, in fact, a U.S. person. For information reporting purposes, certain brokers with substantial U.S. ownership or operations will generally be treated in a manner similar to U.S. brokers.

Backup withholding is not an additional tax. Any amounts withheld under the backup withholding rules may be credited against the tax liability of persons subject to backup withholding, provided that the required information is timely furnished to the IRS.

Foreign Accounts

Sections 1471 through 1474 of the Code (commonly referred to as FATCA) impose a U.S. federal withholding tax of 30% on certain payments, including dividends paid on, and the gross proceeds of a disposition

of, our common stock paid to a foreign financial institution (as specifically defined by applicable 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 U.S. account holders of such institution (which includes certain equity holders of such institution, as well as certain account holders that are foreign entities with U.S. owners). FATCA also generally imposes a federal withholding tax of 30% on certain payments, including dividends paid on, and the gross proceeds of a disposition of, our common stock to a non-financial foreign entity unless such entity provides the withholding agent with either a certification that it does not have any substantial direct or indirect U.S. owners or provides information regarding substantial direct and indirect U.S. owners of the entity. An intergovernmental agreement between the United States and an applicable foreign country may modify those requirements. The withholding tax described above will not apply if the foreign financial institution or non-financial foreign entity otherwise qualifies for an exemption from the rules.

The withholding provisions described above currently apply to payments of dividends, and, subject to the recently released proposed Treasury Regulations described below, will apply to payments of gross proceeds from a sale or other disposition of common stock on or after January 1, 2019.

The U.S. Treasury Department recently released proposed regulations which, if finalized in their present form, would eliminate the federal withholding tax of 30% applicable to the gross proceeds of a disposition 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. Holders are encouraged to consult with their own tax advisors regarding the possible implications of FATCA on their investment in our common stock.

EACH PROSPECTIVE INVESTOR SHOULD CONSULT ITS OWN TAX ADVISOR REGARDING THE TAX CONSEQUENCES OF PURCHASING, HOLDING, AND DISPOSING OF OUR COMMON STOCK, INCLUDING THE CONSEQUENCES OF ANY RECENT OR PROPOSED CHANGE IN APPLICABLE LAW.

UNDERWRITERS

Under the terms and subject to the conditions in an underwriting agreement dated the date of this prospectus, the underwriters named below, for whom Morgan Stanley & Co. LLC, BofA Securities, Inc., and Cowen and Company, LLC are acting as representatives, have severally agreed to purchase, and we have agreed to sell to them, severally, the number of shares indicated below:

Name	Number of Shares
Morgan Stanley & Co. LLC	
BofA Securities, Inc.	
Cowen and Company, LLC	
Oppenheimer & Co. Inc.	
Total:	6,666,667

The underwriters and the representatives are collectively referred to as the "underwriters" and the "representatives," respectively. The underwriters are offering the shares of common stock subject to their acceptance of the shares from us and subject to prior sale. The underwriting agreement provides that the obligations of the several underwriters to pay for and accept delivery of the shares of common stock offered by this prospectus are subject to the approval of certain legal matters by their counsel and to certain other conditions. The underwriters are obligated to take and pay for all of the shares of common stock offered by this prospectus if any such shares are taken. However, the underwriters are not required to take or pay for the shares covered by the underwriters' over-allotment option described below.

The underwriters initially propose to offer part of the shares of common stock directly to the public at the offering price listed on the cover page of this prospectus and part to certain dealers. After the initial offering of the shares of common stock, the offering price and other selling terms may from time to time be varied by the representatives.

We have granted to the underwriters an option, exercisable for 30 days from the date of this prospectus, to purchase up to 1,000,000 additional shares of common stock at the public offering price listed on the cover page of this prospectus, less underwriting discounts and commissions. The underwriters may exercise this option solely for the purpose of covering over-allotments, if any, made in connection with the offering of the shares of common stock offered by this prospectus. To the extent the option is exercised, each underwriter will become obligated, subject to certain conditions, to purchase about the same percentage of the additional shares of common stock as the number listed next to the underwriter's name in the preceding table bears to the total number of shares of common stock listed next to the names of all underwriters in the preceding table.

The following table shows the per share and total public offering price, underwriting discounts and commissions, and proceeds before expenses to us. These amounts are shown assuming both no exercise and full exercise of the underwriters' option to purchase up to an additional 1,000,000 shares of common stock.

		Total	
	Per Share	No Exercise	Full Exercise
Public offering price	$	$	$
Underwriting discounts and commissions to be paid by us:	$	$	$
Proceeds, before expenses, to us	$	$	$

The estimated offering expenses payable by us, exclusive of the underwriting discounts and commissions, are approximately $3.2 million. We have agreed to reimburse the underwriters for expenses up to $37,500 relating to clearance of this offering with the Financial Industry Regulatory Authority and compliance with state securities or "blue sky" laws.

The underwriters have informed us that they do not intend sales to discretionary accounts to exceed 5% of the total number of shares of common stock offered by them.

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

We and all directors, officers, and the holders of substantially all of our outstanding stock and stock options have agreed that, without the prior written consent of the representatives on behalf of the underwriters, we and they will not, during the period ending 180 days after the date of this prospectus (the “restricted period”):

- offer, pledge, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase, lend, or otherwise transfer or dispose of, directly or indirectly, any shares of common stock or any securities convertible into or exercisable or exchangeable for shares of common stock;
- file any registration statement with the Securities and Exchange Commission relating to the offering of any shares of common stock or any securities convertible into or exercisable or exchangeable for common stock; or
- enter into any swap or other arrangement that transfers to another, in whole or in part, any of the economic consequences of ownership of the common stock.

whether any such transaction described above is to be settled by delivery of common stock or such other securities, in cash or otherwise. In addition, we and each such person agrees that, without the prior written consent of the representatives on behalf of the underwriters, we or such other person will not, during the restricted period, make any demand for, or exercise any right with respect to, the registration of any shares of common stock or any security convertible into or exercisable or exchangeable for common stock.

The restrictions described in the immediately preceding paragraph to do not apply to our directors, officers, or holders of our outstanding common stock or other securities in certain circumstances, including (i) transactions by any person other than us relating to shares of our common stock or other securities acquired in this offering or in open market transactions after the closing of this offering, provided that no filing under Section 16(a) of the Securities Exchange Act of 1934, as amended (the “Exchange Act”) would be required or voluntarily made in connection with subsequent sales of the common stock or other securities acquired in such open market transactions; (ii) transfers of our common stock as bona fide gifts, by will, to an immediate family member or to certain trusts provided that no filing under Section 16(a) of the Exchange Act would be required or voluntarily made; (iii) distributions of our common stock to another corporation, partnership, limited liability company, trust, or other business entity that is an affiliate, or to an entity controlled or managed by an affiliate provided that no filing under Section 16(a) of the Exchange Act would be required or voluntarily made; (iv) distributions of our common stock to the stockholders, partners, or members of such holders provided that no filing under Section 16(a) of the Exchange Act would be required or voluntarily made; (v) the exercise of options or other equity awards granted under a stock incentive plan or other equity award plan described in this prospectus, or the exercise of warrants outstanding described in this prospectus provided that no filing under Section 16(a) of the Exchange Act would be required or voluntarily made within 60 days after the date of the final prospectus; (vi) transfers of our common stock to us for the net exercise of options, settlement of warrants granted pursuant to our equity incentive plans, or to cover tax withholding for grants pursuant to our equity incentive plans, provided that no filing under Section 16(a) of the Exchange Act would be required or voluntarily made within 60 days after the date of the final prospectus; (vii) the establishment by such holders of trading plans under Rule 10b5-1 under the Exchange Act provided that such plan does not provide for the transfer of common stock during the restricted period; (viii) transfers of our common stock pursuant to a domestic order, divorce settlement, or other court order; (ix) transfers of our common stock to us pursuant to any right to repurchase or any right of first refusal we may have over such shares; (x) conversion of our outstanding redeemable convertible preferred stock into common stock in connection with the closing of this offering; and (xi) transfers of our common stock pursuant to a bona fide third-party tender offer, merger, consolidation, or other similar transaction

that is approved by our board of directors. These restrictions also do not apply to us in certain circumstances including in connection with the issuance of up to 5% of our shares of common stock outstanding immediately following the closing of this offering in acquisitions or other similar strategic transactions.

The representatives, in their sole discretion, may release the common stock and other securities subject to the lock-up agreements described above in whole or in part at any time.

In order to facilitate the offering of the common stock, the underwriters may engage in transactions that stabilize, maintain, or otherwise affect the price of the common stock. Specifically, the underwriters may sell more shares than they are obligated to purchase under the underwriting agreement, creating a short position. A short sale is covered if the short position is no greater than the number of shares available for purchase by the underwriters under the over-allotment option described above. The underwriters can close out a covered short sale by exercising the over-allotment option or purchasing shares in the open market. In determining the source of shares to close out a covered short sale, the underwriters will consider, among other things, the open market price of shares compared to the price available under the over-allotment option. The underwriters may also sell shares in excess of the over-allotment option, creating a naked short position. The underwriters must close out any 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 this offering. As an additional means of facilitating this offering, the underwriters may bid for, and purchase, shares of common stock in the open market to stabilize the price of the common stock. These activities may raise or maintain the market price of the common stock above independent market levels or prevent or retard a decline in the market price of the common stock. The underwriters are not required to engage in these activities and may end any of these activities at any time.

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

A prospectus in electronic format may be made available on websites maintained by one or more underwriters, or selling group members, if any, participating in this offering. The representatives may agree to allocate a number of shares of common stock to underwriters for sale to their online brokerage account holders. Internet distributions will be allocated by the representatives to underwriters that may make Internet distributions on the same basis as other allocations.

Other Relationships

The underwriters and their respective affiliates are full service financial institutions engaged in various activities, which may include securities trading, commercial and investment banking, financial advisory, investment management, investment research, principal investment, hedging, financing, and brokerage activities. Certain of the underwriters and their respective affiliates have, from time to time, performed, and may in the future perform, various financial advisory and investment banking services for us, for which they received or will receive customary fees and expenses.

In addition, in the ordinary course of their various business activities, the underwriters and their respective affiliates may make or hold a broad array of investments and actively trade debt and equity securities (or related derivative securities) and financial instruments (including bank loans) for their own account and for the accounts of their customers and may at any time hold long and short positions in such securities and instruments. Such investment and securities activities may involve our securities and instruments. The underwriters and their respective affiliates may also make investment recommendations or publish or express independent research views in respect of such securities or instruments and may at any time hold, or recommend to clients that they acquire, long or short positions in such securities and instruments.

Pricing of the Offering

Prior to this offering, there has been no public market for our common stock. The initial public offering price will be determined by negotiations between us and the representatives. Among the factors considered in determining the initial public offering price were our future prospects and those of our industry in general, our sales, earnings, and certain other financial and operating information in recent periods, and the price-earnings ratios, price-sales ratios, market prices of securities, and certain financial and operating information of companies engaged in activities similar to ours.

Directed Share Program

At our request, the underwriters have reserved up to 333,333 shares of common stock, or up to 5% of the shares offered by this prospectus, for sale at the initial public offering price through a directed share program to our non-employee directors. The sales will be made at our direction by Morgan Stanley & Co. LLC and its affiliates through a directed share program. The number of shares of our common stock available for sale to the general public in this offering will be reduced to the extent that such persons purchase such reserved shares. Any reserved shares not so purchased will be offered by the underwriters to the general public on the same terms as the other shares of common stock offered by this prospectus. Any of our non-employee directors that participate in this directed share program will be subject to lockup and market standoff restrictions with the underwriters and with us with respect to any shares purchased through the directed share program. We have agreed to indemnify the underwriters against certain liabilities and expenses, including liabilities under the Securities Act, in connection with the sales of the shares reserved for the directed share program.

Selling Restrictions

Notice to Prospective Investors in Canada

The shares of our common stock may be sold 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 of our common stock 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 (or, in the case of securities issued or guaranteed by the government of a non-Canadian jurisdiction, section 3A.4) 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.

Notice to Prospective Investors in the European Economic Area

In relation to each Member State of the European Economic Area which has implemented the Prospectus Directive (each, a "Relevant Member State") an offer to the public of any shares 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 any shares of our common stock may be made at any time under the following exemptions under the Prospectus Directive, if they have been implemented in that Relevant Member State:

(a) to any legal entity which is a qualified investor as defined in the Prospectus Directive;

(b) to fewer than 100 or, if the Relevant Member State has implemented the relevant provision of the 2010 PD Amending Directive, 150, natural or legal persons (other than qualified investors as defined in the Prospectus Directive), as permitted under the Prospectus Directive, subject to obtaining the prior consent of the representatives for any such offer; or

(c) in any other circumstances falling within Article 3(2) of the Prospectus Directive, provided that no such offer of shares of our common stock shall result in a requirement for the publication by us or any underwriter of a prospectus pursuant to Article 3 of the Prospectus Directive.

For the purposes of this provision, the expression an "offer to the public" in relation to any shares of 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 any shares of our common stock to be offered so as to enable an investor to decide to purchase any shares of our common stock, as the same may be varied in that Member State by any measure implementing the Prospectus Directive in that Member State, the expression "Prospectus Directive" means Directive 2003/71/EC (and amendments thereto, including the 2010 PD Amending Directive, to the extent implemented in the Relevant Member State), and includes any relevant implementing measure in the Relevant Member State, and the expression "2010 PD Amending Directive" means Directive 2010/73/EU.

Notice to Prospective Investors in the United Kingdom

Each underwriter has represented and agreed that:

(a) it has only communicated or caused to be communicated and will only communicate or cause to be communicated an invitation or inducement to engage in investment activity (within the meaning of Section 21 of the Financial Services and Markets Act 2000 ("FSMA") received by it in connection with the issue or sale of the shares of our common stock in circumstances in which Section 21(1) of the FSMA does not apply to us; and

(b) it has complied and will comply with all applicable provisions of the FSMA with respect to anything done by it in relation to the shares of our common stock in, from or otherwise involving the United Kingdom.

Notice to Prospective Investors in Switzerland

The shares 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 document 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 document nor any other offering or marketing material relating to the shares or the offering may be publicly distributed or otherwise made publicly available in Switzerland.

Neither this document nor any other offering or marketing material relating to the offering, Personalis, Inc., or the shares have been or will be filed with or approved by any Swiss regulatory authority. In particular, this document will not be filed with, and the offer of shares will not be supervised by, the Swiss Financial Market Supervisory Authority FINMA ("FINMA"), and the offer of shares 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.

Notice to Prospective Investors in the 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 the prospectus. The shares to which this prospectus relates may be illiquid and/or subject to restrictions on their resale. Prospective purchasers of the shares offered should conduct their own due diligence on the shares. If you do not understand the contents of this prospectus you should consult an authorized financial advisor.

Notice to Prospective Investors in Australia

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

Any offer in Australia of the shares may only be made to persons (the "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 the 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.

Notice to Prospective Investors in Hong Kong

The shares have not been offered or sold and will not be offered or sold in Hong Kong, by means of any document, other than (a) to "professional investors" as defined in the Securities and Futures Ordinance (Cap. 571) of Hong Kong and any rules made under that Ordinance; or (b) in other circumstances which do not result in the document being a "prospectus" as defined in the Companies Ordinance (Cap. 32) of Hong Kong or which do not constitute an offer to the public within the meaning of that Ordinance. No advertisement, invitation, or document relating to the shares has been or may be issued or has been or may be in the possession of any person for the purposes of issue, 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 of 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" as defined in the Securities and Futures Ordinance and any rules made under that Ordinance.

Notice to Prospective Investors in Japan

The shares have not been and will not be registered under the Financial Instruments and Exchange Law of Japan (Law No. 25 of 1948, as amended) and, accordingly, will not be offered or sold, directly or indirectly, in

Japan, or for the benefit of any Japanese Person or to others for re-offering or resale, directly or indirectly, in Japan or to any Japanese Person, except in compliance with all applicable laws, regulations, and ministerial guidelines promulgated by relevant Japanese governmental or regulatory authorities in effect at the relevant time. For the purposes of this paragraph, "Japanese Person" shall mean any person resident in Japan, including any corporation or other entity organized under the laws of Japan.

Notice to Prospective Investors in Singapore

This prospectus has not been registered as a prospectus with the Monetary Authority of Singapore. Accordingly, the shares were not offered or sold or caused to be made the subject of an invitation for subscription or purchase and will not be offered or sold or caused to be made the subject of an invitation for subscription or purchase, and this prospectus or any other document or material in connection with the offer or sale, or invitation for subscription or purchase, of the shares, has not been circulated or distributed, nor will it be circulated or distributed, whether directly or indirectly, to any person in Singapore other than (i) to an institutional investor (as defined in Section 4A of the Securities and Futures Act (Chapter 289) of Singapore, as modified or amended from time to time (the "SFA")) pursuant to 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.

Where the shares are subscribed or purchased under Section 275 of the SFA by a relevant person, which is:

(a) 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; or

(b) a trust (where the trustee is not an accredited investor), whose sole purpose is to hold investments and each beneficiary of the trust is an individual who is an accredited investor,

securities or securities-based derivatives contracts (each term as defined in Section 2(1) of the SFA) of that corporation or the beneficiaries' rights and interest (howsoever described) in that trust shall not be transferred within six months after that corporation or that trust has acquired the shares pursuant to an offer made under Section 275 of the SFA, except:

(a) to an institutional investor or to a relevant person, or to any person arising from an offer referred to in Section 275(1A) or Section 276(4)(i)(B) of the SFA;

(b) where no consideration is or will be given for the transfer;

(c) where the transfer is by operation of law; or

(d) as specified in Section 276(7) of the SFA.

LEGAL MATTERS

The validity of the shares of common stock being offered by this prospectus will be passed upon for us by Cooley LLP, Palo Alto, California. As of the date of this prospectus, GC&H Investments, LLC, an entity comprised of partners and associates of Cooley LLP, beneficially owns 21,170 shares of our preferred stock, which will be converted into 21,170 shares of our common stock upon completion of this offering. Davis Polk & Wardwell LLP, Menlo Park, California, has acted as counsel to the underwriters in connection with this offering.

EXPERTS

The consolidated financial statements as of December 31, 2018 and 2017, and for each of the two years in the period ended December 31, 2018, included in this prospectus have been audited by Deloitte & Touche LLP, an independent registered public accounting firm, as stated in their report appearing herein. Such consolidated financial statements have been so included in reliance upon the report of such firm given upon their authority as experts in accounting and auditing.

CHANGES IN INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

In November 2018, our Board of Directors dismissed Moss Adams LLP ("Moss Adams") as our independent registered public accounting firm and engaged Deloitte & Touche LLP. Moss Adams' report on our financial statements for 2016 did not contain an adverse opinion or disclaimer of opinion and was not qualified or modified as to uncertainty, audit scope, or accounting principles. There were (i) no disagreements with Moss Adams on any matter of accounting principles or practices, financial statement disclosure, or auditing scope or procedures, which disagreements, if not resolved to the satisfaction of Moss Adams, would have caused Moss Adams to make reference to the subject matter of the disagreements in connection with its reports and (ii) no reportable events of the type listed in paragraphs (A) through (D) of Item 304(a)(1)(v) of Regulation S-K issued by the SEC, in connection with the audit of our financial statements for 2016 and the subsequent period through the replacement of Moss Adams with Deloitte & Touche LLP.

Neither we nor anyone acting on our behalf consulted with Deloitte & Touche LLP at any time prior to their retention by us as our independent registered public accounting firm regarding any of the matters described in Item 304(a)(2)(i) or Item 304(a)(2)(ii) of Regulation S-K.

We have provided Moss Adams with a copy of the disclosures set forth under the heading "Changes in Independent Registered Public Accounting Firm" included in this prospectus and have requested that Moss Adams furnish a letter addressed to the SEC stating whether or not Moss Adams agrees with statements related to them made by us under the heading "Changes in Independent Registered Public Accounting Firm" in this prospectus. A copy of that letter is filed as Exhibit 16.1 to the registration statement of which this prospectus forms a part.

WHERE YOU CAN FIND MORE INFORMATION

We have filed with the SEC a registration statement on Form S-1, including exhibits and schedules, under the Securities Act, with respect to the shares of common stock being offered by this prospectus. This prospectus, which constitutes part of the registration statement, does not contain all of the information in the registration statement and its exhibits. For further information with respect to us and the common stock offered by this prospectus, we refer you to the registration statement and its exhibits. Statements contained in this prospectus as to the contents of any contract or any other document referred to are not necessarily complete, and in each instance, we refer you to the copy of the contract or other document filed as an exhibit to the registration statement. Each of these statements is qualified in all respects by this reference.

You can read our SEC filings, including the registration statement, over the Internet at the SEC's website at www.sec.gov.

Upon the closing of this offering, we will be subject to the information reporting requirements of the Securities Exchange Act of 1934 and we will file reports, proxy statements, and other information with the SEC. These reports, proxy statements and other information will be available for inspection at the web site of the SEC referred to above. We also maintain a website at https://www.personalis.com, at which, following the closing of this offering, you may access these materials free of charge as soon as reasonably practicable after they are electronically filed with, or furnished to, the SEC. Information contained on or accessible through our website is not a part of this prospectus, and the inclusion of our website address in this prospectus is an inactive textual reference only.

PERSONALIS, INC. AND SUBSIDIARY

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the stockholders and the Board of Directors of Personalis, Inc.

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Personalis, Inc. and subsidiary (the "Company") as of December 31, 2017 and 2018, and the related consolidated statements of operations, comprehensive loss, redeemable convertible preferred stock and stockholders' deficit, and cash flows, for each of the two years in the period ended December 31, 2018, and the related notes (collectively, 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 each of the two years in the period ended December 31, 2018, in conformity with accounting principles generally accepted in the United States of America.

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) (the "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 audits 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/ DELOITTE & TOUCHE LLP
San Jose, California
March 27, 2019 (June 4, 2019 as to the effects of the reverse stock split described in the second paragraph in Note 2)

We have served as the Company's auditor since 2018.

PERSONALIS, INC. AND SUBSIDIARY
CONSOLIDATED BALANCE SHEETS
(in thousands, except share and per share data)

	As of December 31,		As of March 31, 2019	Pro Forma March 31, 2019
	2017	2018	(unaudited)	(unaudited)
Assets				
Current assets				
Cash and cash equivalents	$ 22,617	$ 19,744	$ 33,237	$ 33,245
Accounts receivable	1,937	4,457	3,110	3,110
Inventory and other deferred costs	1,364	3,432	2,884	2,884
Prepaid expenses and other current assets	808	1,926	3,692	3,692
Total current assets	26,726	29,559	42,923	42,931
Property and equipment, net	6,342	11,452	12,218	12,218
Operating lease right-of-use assets	—	—	1,537	1,537
Other long-term assets	495	659	969	969
Total assets	$ 33,563	$ 41,670	$ 57,647	$ 57,655
Liabilities, Redeemable Convertible Preferred Stock, and Stockholders' Deficit				
Current liabilities				
Accounts payable	$ 4,035	$ 6,565	$ 7,997	$ 7,997
Accrued and other current liabilities	2,757	3,392	5,959	5,959
Contract liabilities	24,690	42,897	44,315	44,315
Short-term debt	17,506	4,996	—	—
Total current liabilities	48,988	57,850	58,271	58,271
Redeemable convertible preferred stock warrant liability	292	683	817	—
Compound derivative instrument	671	—	—	—
Long-term debt	—	—	18,941	18,941
Other long-term liabilities	220	121	737	737
Total liabilities	50,171	58,654	78,766	77,949
Commitments and contingencies (see Note 11)				
Total redeemable convertible preferred stock:				
Series A redeemable convertible preferred stock, $0.0001 par value—31,250,00 shares authorized and 7,812,497 shares issued and outstanding (liquidation preference of $2.624) as of December 31, 2017, December 31, 2018, and March 31, 2019; no shares authorized, issued, or outstanding, pro forma	20,261	20,261	20,261	—
Series B redeemable convertible preferred stock, $0.0001 par value—19,288,150 shares authorized and 4,799,548 shares issued or outstanding (liquidation preference of $4.600) as of December 31, 2017, December 31, 2018, and March 31, 2019; no shares authorized, issued, or outstanding, pro forma	22,047	22,047	22,047	—
Series C redeemable convertible preferred stock, $0.0001 par value—18,000,000 shares authorized and 4,194,700 shares issued and outstanding (liquidation preference of $8.052) as of December 31, 2017; 24,700,000 shares authorized and 5,862,697 shares issued and outstanding (liquidation preference of $8.052) as of December 31, 2018 and March 31, 2019; no shares authorized, issued, or outstanding, pro forma	33,687	47,096	47,096	—
Stockholders' deficit				
Common stock, $0.0001 par value—96,000,000 shares authorized and 3,051,467 shares issued and outstanding as of December 31, 2017; 102,700,000 shares authorized and 3,085,307 shares issued and outstanding as of December 31, 2018; 105,700,000 shares authorized and 3,166,316 shares issued and outstanding as of March 31, 2019; 105,700,000 shares authorized and 21,829,701 shares issued and outstanding, pro forma	1	1	1	2
Additional paid-in capital	3,025	9,131	10,666	101,784
Accumulated other comprehensive loss	(10)	(15)	—	—
Accumulated deficit	(95,619)	(115,505)	(121,190)	(122,080)
Total stockholders' deficit	(92,603)	(106,388)	(110,523)	(20,294)
Total liabilities, redeemable convertible preferred stock, and stockholders' deficit	$ 33,563	$ 41,670	$ 57,647	$ 57,655

See accompanying notes to consolidated financial statements.

PERSONALIS, INC. AND SUBSIDIARY
CONSOLIDATED STATEMENTS OF OPERATIONS
(in thousands, except share and per share data)

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
Revenues	$ 9,393	$ 37,774	$ 4,164	$ 14,075
Costs and expenses				
Costs of revenues	11,736	25,969	4,065	10,091
Research and development	9,919	14,304	2,949	5,245
Selling, general, and administrative	9,901	11,271	2,313	4,170
Total costs and expenses	31,556	51,544	9,327	19,506
Loss from operations	(22,163)	(13,770)	(5,163)	(5,431)
Interest income	100	293	61	84
Interest expense	(1,303)	(1,894)	(622)	(184)
Loss on debt extinguishment	—	(4,658)	—	—
Other (expense) income, net	(227)	150	351	(152)
Loss before income taxes	(23,593)	(19,879)	(5,373)	(5,683)
Provision for income taxes	(5)	(7)	(2)	(2)
Net loss	$ (23,598)	$ (19,886)	$ (5,375)	$ (5,685)
Net loss per share, basic and diluted	(7.78)	(6.49)	(1.76)	(1.84)
Weighted-average shares outstanding, basic and diluted	3,031,636	3,063,157	3,051,581	3,091,342
Pro forma net loss per share, basic and diluted (unaudited)		$ (0.95)		$ (0.26)
Pro forma weighted-average shares outstanding, basic and diluted (unaudited)		20,483,543		21,754,727

See accompanying notes to consolidated financial statements.

PERSONALIS, INC. AND SUBSIDIARY
CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS
(in thousands)

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
Net loss	$(23,598)	$(19,886)	$(5,375)	$(5,685)
Other comprehensive income (loss)				
Foreign currency translation adjustment	7	(5)	3	15
Comprehensive loss	$(23,591)	$(19,891)	$(5,372)	$(5,670)

See accompanying notes to consolidated financial statements.

PERSONALIS, INC. AND SUBSIDIARY
CONSOLIDATED STATEMENTS OF REDEEMABLE CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' DEFICIT
(in thousands, except share data)

	Series A Redeemable Convertible Preferred Stock		Series B Redeemable Convertible Preferred Stock		Series C Redeemable Convertible Preferred Stock		Total	Common Stock		Additional Paid-in Capital	Accumulated Other Comprehensive Loss	Accumulated Deficit	Total Stockholders' Deficit
	Shares	Amount	Shares	Amount	Shares	Amount	Amount	Shares	Amount				
Balances at December 31, 2016	7,812,497	$ 20,261	4,799,548	$ 22,047	4,194,700	$ 33,687	$ 75,995	3,020,842	$ 1	$ 2,196	$ (17)	$ (72,021)	$ (69,841)
Proceeds from exercise of stock options								30,625	—	76			76
Stock-based compensation expense										753			753
Translation adjustments											7		7
Net loss												(23,598)	(23,598)
Balances at December 31, 2017	7,812,497	20,261	4,799,548	22,047	4,194,700	33,687	75,995	3,051,467	$ 1	3,025	(10)	(95,619)	(92,603)
Convertible Notes conversion on September 20, 2018 (see Note 6), net of issuance cost					1,667,997	13,409	13,409						
Equity component credited to additional paid-in capital upon Convertible Notes modifications on May 31, 2018 and August 20, 2018 (see Note 6)										4,690			4,690
Proceeds from exercise of stock options								33,840	—	99			99
Stock-based compensation expense										1,317			1,317
Translation adjustments											(5)		(5)
Net loss												(19,886)	(19,886)
Balances at December 31, 2018	7,812,497	$ 20,261	4,799,548	$ 22,047	5,862,697	$ 47,096	$ 89,404	3,085,307	$ 1	$ 9,131	$ (15)	$ (115,505)	$ (106,388)

See accompanying notes to consolidated financial statements.

PERSONALIS, INC. AND SUBSIDIARY
CONSOLIDATED STATEMENTS OF REDEEMABLE CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' DEFICIT
(in thousands, except share data)

	Series A Redeemable Convertible Preferred Stock		Series B Redeemable Convertible Preferred Stock		Series C Redeemable Convertible Preferred Stock		Total	Common Stock		Additional Paid-in Capital	Accumulated Other Comprehensive Loss	Accumulated Deficit	Total Stockholders' Deficit
	Shares	Amount	Shares	Amount	Shares	Amount	Amount	Shares	Amount				
Balances at December 31, 2017	7,812,497	$20,261	4,799,548	$22,047	4,194,700	$33,687	$75,995	3,051,467	$ 1	$ 3,025	$ (10)	$ (95,619)	$ (92,603)
Stock-based compensation expense										172			172
Proceeds from exercise of stock options								12,656	—	23			23
Translation adjustments											3		3
Net loss												(5,375)	(5,375)
Balances at March 31, 2018	7,812,497	$20,261	4,799,548	$22,047	4,194,700	$33,687	$75,995	3,064,123	$ 1	$ 3,220	$ (7)	$ (100,994)	$ (97,780)
Balances at December 31, 2018	7,812,497	$20,261	4,799,548	$22,047	5,862,697	$47,096	$89,404	3,085,307	$ 1	$ 9,131	$ (15)	$ (115,505)	$ (106,388)
Stock-based compensation expense										609			609
Proceeds from exercise of stock options								81,009	—	354			354
Issuance of common stock warrants (Note 8)										572			572
Translation adjustments											15		15
Net loss												(5,685)	(5,685)
Balances at March 31, 2019	7,812,497	$20,261	4,799,548	$22,047	5,862,697	$47,096	$89,404	3,166,316	$ 1	$ 10,666	$ (0)	$ (121,190)	$ (110,523)

PERSONALIS, INC. AND SUBSIDIARY
CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
Cash flows from operating activities:				
Net loss	$ (23,598)	$ (19,886)	$ (5,375)	$ (5,685)
Adjustments to reconcile net loss to net cash provided by operating activities				
Depreciation and amortization	1,216	3,066	471	1,047
Noncash lease expense	—	—	—	214
Stock-based compensation expense	753	1,317	169	609
Loss on debt extinguishment	—	4,658	—	—
Change in fair value of convertible preferred stock warrant liability	64	391	—	134
Change in fair value of compound derivative instrument	162	(574)	(353)	—
Accretion of noncash interest and debt reduction	928	1,188	475	22
Other	6	(5)	5	13
Changes in operating assets and liabilities				
Accounts receivable	(1,203)	(2,519)	177	1,346
Inventories and other deferred costs	(539)	(2,068)	(967)	548
Prepaid expenses and other current assets	177	(1,265)	22	(108)
Accounts payable	2,635	2,164	(732)	(820)
Accrued and other current liabilities	684	997	529	1,587
Contract liabilities	19,072	18,207	6,322	1,419
Other long-term liabilities	(67)	(99)	(20)	(260)
Net cash provided by operating activities	290	5,572	723	66
Cash flows from investing activities:				
Purchase of property and equipment	(5,158)	(7,852)	(1,309)	(960)
Net cash used in investing activities	(5,158)	(7,852)	(1,309)	(960)
Cash flows from financing activities:				
Borrowings	17,225	—	—	20,000
Payments of costs related to initial public offering				(477)
Debt issuance cost	(63)	—	—	(490)
Repayments under borrowing arrangements	(823)	(645)	(212)	(5,000)
Series C redeemable convertible preferred stock issuance costs	0	(22)	—	—
Proceeds from exercise of stock options	65	76	23	353
Net cash provided by (used in) financing activities	16,404	(591)	(189)	14,386
Effect of exchange rates on cash and cash equivalents	4	(2)	2	1
Net increase (decrease) in cash and cash equivalents	11,540	(2,873)	(773)	13,493
Cash and cash equivalents, beginning of the period	11,077	22,617	22,617	19,744
Cash and cash equivalents, end of the period	$ 22,617	$ 19,744	$ 21,844	$ 33,237
Supplemental disclosures of cash flow information:				
Cash paid for interest	$ 321	$ 698	$ 145	$ 375
Income taxes paid	5	7	—	—
Supplemental disclosures of noncash investing and financing activities:				
Property and equipment costs incurred but not paid	521	323	930	854
Convertible Notes conversion on September 20, 2018 (see Note 6)	—	13,431	—	—
Recognition of operating lease right-of-use asset	—	—	—	1,750
Unpaid initial public offering costs	—	—	—	1,487

See accompanying notes to consolidated financial statements.

PERSONALIS, INC. AND SUBSIDIARY
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Note 1. Company and Nature of Business

Description of Business

Personalis, Inc. (the "Company") was incorporated in Delaware on February 21, 2011, and began operations in September 2011. The Company formed a wholly owned subsidiary, Personalis (UK) Ltd., in August 2013.

The Company is a growing cancer genomics company transforming the development of next-generation therapies by providing more comprehensive molecular data about each patient's cancer and immune response. The Company designed its NeXT Platform to adapt to the complex and evolving understanding of cancer, providing its biopharmaceutical customers with information on all of the approximately 20,000 human genes, together with the immune system, in contrast to many cancer panels that cover roughly 50 to 500 genes.

Significant Risks and Uncertainties

Since inception, the Company has been engaged in developing its complete sequencing technology, raising capital, and recruiting personnel. The Company has incurred net operating losses and negative cash flows from operations every year. At December 31, 2017 and 2018, the Company had an accumulated deficit of $95.6 million and $115.5 million, respectively, and $121.2 million for the three months ended March 31, 2019 (unaudited). The Company believes that its existing sources of liquidity will satisfy its working capital and capital requirements for at least 12 months. Failure to generate sufficient revenues, achieve planned gross margins, or control operating costs will require the Company to raise additional capital through equity or debt financing. Such additional financing may not be available on acceptable terms, or at all, and could require the Company to modify, delay, or abandon some of its planned future expansion or expenditures or reduce some of its ongoing operating costs, which could harm its business, operating results, financial condition, and ability to achieve its intended business objectives.

Note 2. Summary of Significant Accounting Policies

Basis of Presentation

The accompanying consolidated financial statements have been prepared in accordance with accounting principles generally accepted in the United States of America ("GAAP") and include all adjustments necessary for the fair presentation of the Company's consolidated financial position, results of operations, and cash flows as of and for the years ended December 31, 2017 and 2018. The Company's consolidated financial statements include the accounts of the Company and its wholly owned subsidiary, Personalis (UK), Ltd. All intercompany balances and transactions have been eliminated in consolidation.

Reverse Stock Split

On June 4, 2019, the Company filed an amendment to the Company's amended and restated certificate of incorporation to effect a reverse split of shares of the Company's common stock and redeemable convertible preferred stock on a four-for-one basis (the "Reverse Stock Split"). The par value of the common stock and redeemable convertible preferred stock was not adjusted as a result of the Reverse Stock Split. All references to common stock, options to purchase common stock, share data, per share data, redeemable convertible preferred stock and related information contained in these consolidated financial statements have been retrospectively adjusted to reflect the effect of the Reverse Stock Split for all periods presented.

Unaudited Interim Financial Information

The accompanying consolidated balance sheet as of March 31, 2019, the consolidated statements of operations and of cash flows for the three months ended March 31, 2018 and 2019, and the consolidated

statement of redeemable convertible preferred stock and stockholders' deficit for the three months ended March 31, 2019 are unaudited. The unaudited interim consolidated financial statements have been prepared on the same basis as the audited annual consolidated financial statements and, in the opinion of management, reflect all adjustments, which include only normal recurring adjustments, necessary for the fair statement of the Company's financial position as of March 31, 2019 and the results of its operations and its cash flows for the three months ended March 31, 2018 and 2019. The financial data and other information disclosed in these notes related to the three months ended March 31, 2018 and 2019 are also unaudited. The results for the three months ended March 31, 2019 are not necessarily indicative of results to be expected for the year ending December 31, 2019, any other interim periods, or any future year or period.

Unaudited Pro Forma Information

The March 31, 2019 unaudited consolidated pro forma balance sheet has been prepared assuming the following capital transactions will occur in connection with the Company's offering: (i) the automatic conversion of all outstanding shares of redeemable convertible preferred stock into shares of common stock; (ii) the automatic conversion of two warrants to purchase an aggregate of 84,585 shares of our redeemable convertible preferred stock, outstanding as of March 31, 2019, into warrants to purchase an equivalent number of shares of our common stock, and the related reclassification of redeemable convertible preferred stock warrant liability to stockholders' equity, (iii) the exercise of a warrant to purchase 188,643 shares of common stock, and (iv) stock-based compensation expense of $0.9 million associated with outstanding stock options subject to a performance condition for which the service-based vesting condition was satisfied as of March 31, 2019 and which the Company will recognize in connection with this offering.

The unaudited pro forma stockholders' deficit does not assume any proceeds from the offering.

The unaudited pro forma basic and diluted net loss per share have been computed to give effect to the automatic conversion of the redeemable convertible preferred stock into shares of common stock and the exercise of a warrant to purchase 188,643 shares of common stock as of the beginning of the respective period or the date of issuance, if later.

Use of Estimates

The preparation of consolidated financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, and disclosure of contingent assets and liabilities, at the date of the consolidated financial statements and the reported amounts of revenues and expense during the reporting period. The estimates include, but are not limited to, useful lives assigned to long-lived assets, the valuation of common and convertible redeemable preferred stock and related warrants and options, the valuation of the compound derivative instrument, the valuation of stock-based awards, and provisions for income taxes and contingencies. Actual results could differ from these estimates, and such differences could be material to the Company's consolidated financial position and results of operations.

Segments

The Company determined its reporting and operating segments in accordance with Financial Accounting Standards Board ("FASB") Accounting Standards Codification ("ASC") Topic 280, *Segment Reporting*. The Company identifies an operating segment as an entity component that has its own discrete financial information, which is available and regularly reviewed by the chief operating decision maker or decision-making group when making decisions regarding resource allocation and performance assessment. The Company operates and manages its business as one reportable operating segment, which is the business of advanced genomics. The Company's chief executive officer, who is the chief operating decision maker, reviews financial information on an aggregate basis for purposes of allocating resources and evaluating financial performance.

Fair Value Measurements

The Company's financial instruments consist of cash and cash equivalents, accounts receivable, accounts payable, accrued liabilities, redeemable convertible preferred stock and convertible note liability, compound derivative instrument, and short-term and long-term debt. The Company states accounts receivable, accounts payable, and accrued liabilities at their carrying value, which approximates fair value due to the short time to the expected receipt or payment. The carrying amount of the Company's short-term debt approximates its fair value as the effective interest rate approximates market rates currently available to the Company. The convertible preferred stock warrant liability and compound derivative instrument associated with the Company's convertible note discussed in Note 5 are carried at fair value based on unobservable market inputs.

Cash and Cash Equivalents

The Company considers all highly liquid investments with original maturities of three months or less at the time of purchase to be cash and cash equivalents. Cash and cash equivalents consist primarily of amounts invested in money market funds.

Accounts Receivable

Trade accounts receivable are recorded at the invoiced amount and are noninterest bearing. At each reporting period, management reviews all outstanding customer balances to determine if the facts and circumstances of each customer relationship indicate the need for a reserve. The Company did not have any bad debt expense or allowance for doubtful accounts at December 31, 2017 and 2018 and March 31, 2019 (unaudited).

Inventories and Other Deferred Costs

Inventories, consisting of supplies used in the Company's genomic analysis contracts, are valued at the lower of cost or market value; cost is determined using actual costs, on a first-in, first-out basis. Market value is determined as the lower of replacement cost or net realizable value.

Other deferred costs relate to work in process for costs incurred on genomic analysis contracts that have not been completed or recognized as revenues. Other deferred costs represent materials used in sequencing services, labor, and overhead allocations.

Property and Equipment

Property and equipment are recorded at cost, less accumulated depreciation, and are depreciated on a straight-line basis over the estimated useful lives of the related assets, which is generally three to five years for computer equipment, two years for software, three years for furniture and equipment, and five years for machinery and equipment. Leasehold improvements are depreciated over the shorter of the lease term or the estimated useful life of the related asset. Upon retirement or sale, the cost and related accumulated depreciation and amortization are removed from the consolidated balance sheet, and the resulting gain or loss is reflected in the consolidated statements of operations. Maintenance and repairs that are not considered improvements and do not extend the useful lives of the assets are charged to operations as incurred.

Construction-in-process assets consist primarily of computer equipment and machinery and equipment that have not yet been placed in service. These assets are stated at cost and are not depreciated. Once the assets are placed into service, assets are reclassified to the appropriate asset class based on their nature and depreciated in accordance with the useful lives above.

Internally used software, whether purchased or developed, is capitalized at cost and amortized on a straight-line basis over its estimated useful life. Costs associated with internally developed software are expensed until

the point at which the project has reached the development stage. Subsequent additions, modifications or upgrades to internal-use software are capitalized only to the extent that they provide additional functionality. Software maintenance and training costs are expensed in the period in which they are incurred. The capitalization of software requires judgment in determining when a project has reached the development stage and the period over which the Company expects to benefit from the use of that software.

Deferred Offering Costs

On March 27, 2019, the Company submitted an initial registration statement with the U.S. Securities and Exchange Commission. As of March 31, 2019 (unaudited), deferred offering costs related to the filing totaling $2.0 million were capitalized and are included in "Prepaid expenses and other current assets".

Redeemable Convertible Preferred Stock

The redeemable convertible preferred stock is recorded outside of permanent equity because while it is not mandatorily redeemable, in the event of certain events considered not solely within the Company's control, such as a merger, acquisition, and sale of all or substantially all of the Company's assets (each, a "deemed liquidation event"), the redeemable convertible preferred stock will become redeemable at the option of the holders of at least a majority of the then-outstanding such shares. The Company has not adjusted the carrying values of the redeemable convertible preferred stock to the liquidation preferences of such shares because it is uncertain whether or when a deemed liquidation event would occur that would obligate the Company to pay the liquidation preferences to holders of shares of redeemable convertible preferred stock. Subsequent adjustments to the carrying values of the liquidation preferences will be made only when it becomes probable that such a deemed liquidation event will occur.

Common Stock Warrant

The Company's common stock warrant is classified in equity as it meets all criteria for equity classification. The common stock warrant is recorded at fair value upon issuance as additional paid-in capital in the consolidated balance sheets. The common stock warrant is not remeasured after the issuance date.

Convertible Preferred Stock Warrants

The Company's convertible preferred stock warrants require liability classification and accounting as the underlying convertible preferred stock is considered contingently redeemable and may obligate the Company to transfer assets to the holders at a future date upon occurrence of a deemed liquidation event. The warrants are recorded at fair value upon issuance and are subject to remeasurement to fair value at each consolidated balance sheet date, with any changes in fair value recognized in the consolidated statements of operations. The Company will continue to adjust the warrant liability for changes in fair value until the earlier of the exercise or expiration of the convertible preferred stock warrants, occurrence of a deemed liquidation event, or conversion of convertible preferred stock into common stock.

Compound Derivative Instrument

The convertible notes issued in June 2017 (see Note 6) contain embedded features that provide the lenders with multiple settlement alternatives. Certain of these settlement features provide the lenders a right to a fixed number of the Company's shares upon conversion of the notes (the "conversion option"). Other settlement features provide the lenders the right or the obligation to receive cash or a variable number of shares upon the completion of a capital-raising transaction, change of control, or default of the Company (the "redemption features").

Certain conversion and redemption features of the convertible notes met the requirements for separate accounting and were accounted for as a single, compound derivative instrument. The compound derivative instrument was recorded at fair value at inception and was subject to remeasurement to fair value at each consolidated balance sheet date, with any changes in fair value recognized in the consolidated statements of operations (see Note 9).

Concentration of Credit Risk and Other Risks and Uncertainties

Financial instruments that subject the Company to concentration of credit risk consist of cash and cash equivalents. The Company's cash and cash equivalents are deposited with a high-quality financial institution. Deposits at this institution may, at times, exceed federally insured limits. Management believes that this financial institution is financially sound and, accordingly, that minimal credit risk exists. The Company has not experienced any losses on its deposits of cash and cash equivalents.

The Company purchases various reagents and sequencing materials from sole source suppliers. Any extended interruption in the supply of these materials could result in the Company's inability to secure sufficient materials to conduct business and meet customer demand.

The Company routinely assesses the creditworthiness of its customers. The Company has not experienced any material losses related to receivables from individual customers, or groups of customers. The Company does not require collateral. Due to these factors, no additional credit risk is believed by management to be probable in the Company's accounts receivable.

As of December 31, 2017 and 2018 and as of March 31, 2018 and 2019, customers representing greater than 10% of accounts receivable were as follows:

	As of December 31,		As of March 31,	
	2017	2018	2018	2019
			(unaudited)	
Pfizer Inc.	13%	33%	11%	47%
Customer A	*	17%	*	*
Merck & Co., Inc.	38%	10%	22%	*
Customer B	*	10%	*	*
Customer C	13%	*	*	20%
VA MVP	*	*	38%	*

* Less than 10% of accounts receivable.

For the years ended December 31, 2017 and 2018 and for the three months ended March 31, 2018, and 2019, customers representing equal to or greater than 10% of revenues were as follows:

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
VA MVP	*	49%	47%	59%
Merck & Co., Inc.	11%	12%	12%	*
Pfizer Inc.	*	10%	*	17%
Customer A	13%	*	*	*
Customer B	10%	*	*	*

* Less than 10% of revenues.

Revenue Recognition

The Company applies the revenue recognition guidance in accordance with FASB ASC Topic 606, *Revenue from Contracts with Customers*.

Revenue Recognition

The revenue guidance provides a five-step framework through which revenue is recognized when control of promised goods or services is transferred to a customer at an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. To determine revenue recognition for arrangements that the Company concludes are within the scope of the new revenue recognition standard, management performs the following five steps: (i) identifies the contract(s) with a customer; (ii) identifies the performance obligations in the contract(s); (iii) determines the transaction price, including whether there are any constraints on variable consideration; (iv) allocates the transaction price to the performance obligations; and (v) recognizes revenue when (or as) the Company satisfies a performance obligation. At contract inception, once a contract is determined to be within the scope of the new revenue standard, the Company assesses whether individual goods or services promised within each contract are distinct and, therefore, represent separate performance obligation.

The Company derives revenues from sequencing and data analysis services to support the development of personalized cancer vaccines and other next-generation cancer immunotherapies. The Company's contracts are in the form of a combination of signed agreements, statements of work, and/or purchase orders. Under ASC Topic 606, the Company accounts for a contract with a customer when there is approval and commitment from both parties, the rights of the parties are identified, payment terms are identified, the contract has commercial substance, and it is probable that the Company will collect substantially all of the consideration to which it will be entitled.

The sequencing and data analysis services are the only distinct services that meet the definition of a performance obligation and are accounted for as one performance obligation under ASC Topic 606. The Company recognizes revenue from such services at the point in time when control of the test results is transferred to the customer. The Company has elected to exclude all sales and value added taxes from the measurement of the transaction price. Sequencing and data analysis services are based on a fixed price per test.

Payment terms and conditions vary by contract and customer. The Company's standard payment terms are less than 90 days from the invoice date. In instances where the timing of the Company's revenue recognition differs from the timing of its invoicing, the Company does not assess whether a contract has a significant financing component if the expectation at contract inception is such that the period between payment by the customer and the transfer of the promised services to the customer will be one year or less. The Company assessed each of its revenue-generating arrangements in order to determine whether a significant financing component exists and concluded that a significant financing component does not exist in any of its arrangements. The primary purpose of the Company's invoicing terms is to provide customers with simplified and predictable ways of purchasing the Company's services and provides payment protection for the Company.

Practical Expedients and Exemptions

As a practical expedient, the Company recognizes the incremental costs of obtaining contracts, such as sales commissions, as an expense when incurred since the amortization period of the asset the Company otherwise would have recognized is one year or less. Sales commissions are recorded within selling, general, and administrative expenses in the consolidated statements of operations.

Costs of Revenues

The Company's costs of revenues primarily consist of production materials, personnel costs (e.g., salaries, bonuses, benefit, and stock-based compensation), cost of expensed equipment, consumables and laboratory supplies, information technology ("IT") and facility costs, and depreciation and service maintenance contracts on capitalized equipment.

Research and Development Expenses

The Company incurs research and development expenses for costs it incurs in research aimed at developing new product offerings, including lab and automation development costs. The expenses primarily consist of employee-related costs (including stock-based compensation), laboratory and automation supplies and equipment, and related depreciation and amortization expenses.

Stock-Based Compensation

For options granted to employees, non-employees, and directors, stock-based compensation is measured at grant date based on the fair value of the award. The Company determines the grant-date fair value of the options using the Black-Scholes option-pricing model and records forfeitures as they occur. The fair value of options granted to non-employees is amortized over the vesting period.

Fair Value of Common Stock

The fair value of the Company's common stock is determined by the board of directors with assistance from management and, in part, on input from an independent third-party valuation firm. The board of directors determines the fair value of common stock by considering a number of objective and subjective factors, including valuations of comparable companies, sales of redeemable convertible preferred stock, operating and financial performance, the lack of liquidity of the Company's common stock and the general and industry-specific economic outlook.

Foreign Currency Translation

The functional currency of the Company's foreign subsidiary is the British pounds sterling. In preparing its consolidated financial statements, the Company is required to translate the financial statements of this subsidiary from British pounds sterling to U.S. dollars. Accordingly, monetary assets and liabilities of the Company's subsidiary are remeasured using exchange rates in effect at the end of the period. Costs in the local currency are remeasured using average exchange rates for the period, except for costs related to those consolidated balance sheet items that are remeasured using historical exchange rates. Since the Company's functional currency is deemed to be the local currency, any gain or loss associated with the translation of its consolidated financial statements is included, as a component of stockholders' deficit, in accumulated other comprehensive income (loss).

Comprehensive Loss

Comprehensive loss includes all changes in equity (net assets) during the period from nonowner sources. The Company's comprehensive loss consists of its net loss and its cumulative translation adjustments.

Income Taxes

The Company uses the asset and liability method under ASC Topic 740, *Income Taxes*, in accounting for income taxes. Deferred tax assets and liabilities are recognized for the estimated future tax consequences attributable to differences between the consolidated financial statement carrying amounts of existing assets and liabilities and their respective tax bases. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. Deferred tax expenses or benefits are the result of changes in the deferred tax assets and liabilities. Valuation allowances are established when necessary to reduce deferred tax assets where it is more likely than not that the deferred tax assets will not be realized.

ASC Topic 740 clarifies the accounting for uncertainty in income taxes recognized in the financial statements. ASC Topic 740 provides that a tax benefit from an uncertain tax position may be recognized when it

is more likely than not that the position will be sustained upon audit, including resolutions of any related appeals or litigation processes, based on the technical merits of the position. ASC Topic 740 also provides guidance on measurement, derecognition, classification, interest and penalties, accounting in interim periods, disclosure, and transition.

The Company recognizes interest and penalties related to unrecognized tax benefits within the income tax expense line in the accompanying consolidated statements of operations. Accrued interest and penalties are included within the related liability line in the consolidated balance sheets.

Net Loss per Share Attributable to Common Stockholders

Basic net loss per common share is calculated by dividing the net loss attributable to common stockholders by the weighted-average number of shares of common stock outstanding during the period, without consideration of potentially dilutive securities. Diluted net loss per share is computed by dividing the net loss attributable to common stockholders by the weighted-average number of shares of common stock and potentially dilutive securities outstanding for the period. For purposes of the diluted net loss per share calculation, the redeemable convertible preferred stock, convertible preferred stock warrants, common stock warrants, common stock subject to repurchase, and stock options are considered to be potentially dilutive securities. Basic and diluted net loss attributable to common stockholders per share is presented in conformity with the two-class method required for participating securities as the redeemable convertible preferred stock is considered a participating security. The Company's participating securities do not have a contractual obligation to share in the Company's losses. As such, the net loss is attributed entirely to common stockholders. Because the Company has reported a net loss for the reporting periods presented, the diluted net loss per common share is the same as basic net loss per common share for those periods.

Recent Accounting Pronouncements

From time to time, new accounting pronouncements are issued by the FASB or other standard-setting bodies and adopted by the Company as of the specified effective date, unless otherwise discussed below. The Company will meet the definition of a public business entity and will adopt recently issued accounting pronouncements in accordance with the transition provisions and effective dates for public business entities. Below is a summary of the recently issued accounting pronouncements that will be relevant to the Company.

Recently Adopted Accounting Pronouncements

In May 2014, the FASB issued ASU No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*. Subsequently, the FASB also issued ASU No. 2015-14, *Revenue from Contracts with Customers (Topic 606)*, which adjusted the effective date of ASU No. 2014-09; ASU No. 2016-08, *Revenue from Contracts with Customers (Topic 606): Principal versus Agent Considerations (Reporting Revenue Gross versus Net)*, which amends the principal-versus-agent implementation guidance and illustrations in ASU No. 2014-09; ASU No. 2016-10, *Revenue from Contracts with Customers (Topic 606): Identifying Performance Obligations and Licensing*, which clarifies identifying performance obligation and licensing implementation guidance and illustrations in ASU No. 2014-09; and ASU No. 2016-12, *Revenue from Contracts with Customers (Topic 606): Narrow-Scope Improvements and Practical Expedients*, which addresses implementation issues and is intended to reduce the cost and complexity of applying the new revenue standard in ASU No. 2014-09 (collectively, the "Revenue ASUs").

The Revenue ASUs provide an accounting standard for a single comprehensive model for use in accounting for revenue arising from contracts with customers and supersedes most current revenue recognition guidance. The accounting standard is effective for interim and annual periods beginning after December 15, 2017. The guidance permits two methods of adoption: retrospectively to each prior reporting period presented (the full retrospective method), or retrospectively with the cumulative effect of initially applying the guidance recognized

at the date of initial application (the modified retrospective method). The Company performed a detailed review of its revenue agreements and assessed the differences in accounting for such contracts under this guidance compared with previous revenue accounting standards. On January 1, 2017, the Company early adopted ASU No. 2014-09 using the full retrospective method. The adoption of this standard did not have a material impact on the Company's consolidated financial statements. Results for all periods presented are under ASC Topic 606.

In June 2018, the FASB issued ASU No. 2018-07, *Improvements to Nonemployee Share-Based Payment Accounting*. ASU No. 2018-07 simplifies the accounting for share-based payments to nonemployees by aligning it with the accounting for share-based payments to employees, with certain exceptions. For all entities, the amendments are effective for annual periods beginning after December 15, 2019, and interim periods within annual periods beginning after December 15, 2020. Early adoption is permitted for any entity in any interim or annual period for which consolidated financial statements have not been issued or made available for issuance, but not before an entity adopts ASC Topic 606. The Company early adopted this guidance on January 1, 2017, which did not result in a material impact on its consolidated financial statements and related disclosures.

In February 2016, the FASB issued ASU No. 2016-02, *Leases (Topic 842)*. In July 2018, the FASB issued ASU No. 2018-10, *Codification Improvements to Topic 842, Leases*, which provides clarification to ASU 2016-02. These ASUs (collectively, the "new lease standard") require an entity to recognize a lease liability and a right-of-use ("ROU") asset on the balance sheet for leases with lease terms of more than twelve months. Lessor accounting is largely unchanged, while lessees will no longer be provided with a source of off-balance sheet financing. This guidance is effective for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years. In July 2018, the FASB issued ASU No. 2018-11, *Leases (Topic 842)—Targeted Improvements*, which allows entities to elect a modified retrospective transition method where entities may continue to apply the existing lease guidance during the comparative periods and apply the new lease requirements through a cumulative effect adjustment in the period of adoptions rather than in the earliest period presented.

On January 1, 2019, the Company adopted Accounting Standard Update ("ASU") No. 2016-02, Leases (Topic 842), and its associated amendments using the modified retrospective transition method by applying the new standard to all leases existing at the date of initial application and not restating comparative periods. There was no cumulative-effect adjustment recorded to retained earnings upon adoption. Under the standard, a lessee is required to recognize a lease liability and ROU asset for all leases. The new guidance also modified the classification criteria and requires additional disclosures to enable users of financial statements to understand the amount, timing, and uncertainty of cash flows arising from leases. Consistent with current guidance, a lessee's recognition, measurement, and presentation of expenses and cash flows arising from a lease continues to depend primarily on its classification. The Company elected the package of practical expedients permitted under the transition guidance, which allowed the Company to carryforward its historical lease classification, its assessment on whether a contract was or contains a lease, and its initial direct costs for any leases that existed prior to January 1, 2019. In addition, the Company elected the short-term lease exception as a practical expedient.

At the date of adoption (unaudited), the Company derecognized a deferred rent liability in the amount of $0.3 million, and recognized a ROU asset and respective lease liability in the amount of $1.7 million and $2.0 million, respectively. As of March 31, 2019 (unaudited), lease liabilities in the amount of $1.0 million and $0.7 million are included in "Accrued and other current liabilities" and "Other long-term liabilities," respectively.

New Accounting Pronouncements Not Yet Adopted

In July 2017, the FASB issued ASU No. 2017-11, *Earnings Per Share (Topic 260) Distinguishing Liabilities from Equity (Topic 480) Derivatives and Hedging (Topic 815) (Part I) Accounting for Certain Financial Instruments with Down Round Features, (Part II) Replacement of the Indefinite Deferral for Mandatorily Redeemable Financial Instruments of Certain Nonpublic Entities and Certain Mandatorily*

Redeemable Noncontrolling Interests with a Scope Exception. This ASU simplifies the accounting for certain financial instruments with down round features, a provision in an equity-linked financial instrument (or embedded feature) that provides a downward adjustment of the current exercise price based on the price of future equity offerings. Down round features are common in warrants, preferred shares, and convertible debt instruments issued by private companies and early stage public companies. This ASU requires companies to disregard the down round feature when assessing whether the instrument is indexed to its own stock for purposes of determining liability or equity classification. The provisions of this ASU related to down round feature are effective for public entities for fiscal years and interim periods within those fiscal years, beginning after December 15, 2018. Early adoption is permitted. The amendments in Part I should be applied (1) retrospectively to outstanding financial instruments with down round features by means of a cumulative-effect adjustment to the consolidated balance sheets as of the beginning of the first fiscal year and interim periods and (2) retrospectively to outstanding financial instruments with down round features for each prior reporting period presented. The Company is currently evaluating the impact the adoption of this standard will have on its consolidated financial statements and related disclosures.

Note 3. Revenues

The following table presents the Company's revenues disaggregated by customer type (in thousands):

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
VA MVP	$ 421	$18,601	$1,977	$ 8,343
All other customers	8,972	19,173	2,187	5,732
Total	$9,393	$37,774	$4,164	$14,075

Countries outside of the United States, based on the billing addresses of customers, represented less than 2% and 3% of the Company's revenues for the years ended December 31, 2017 and 2018, respectively, and less than 4% and 2% for the three months ended March 31, 2018 and 2019 (unaudited), respectively.

Contract Assets and Liabilities

The Company had no contract assets as of December 31, 2017 and 2018 and March 31, 2019 (unaudited), respectively.

The Company's contract liabilities consist of customer deposits in excess of revenues recognized and are presented as current liabilities in the consolidated balance sheets.

The balance of customer deposits associated with advances received from customers at January 1, 2017 was $5.6 million. The balance of contract liabilities was $24.7 million and $42.9 million at December 31, 2017 and 2018, respectively. Contract liabilities of $1.1 million and $16.0 million were recognized in revenues during the years ended December 31, 2017 and 2018, respectively.

The balance of contract liabilities was $44.3 million at March 31, 2019 (unaudited). Contract liabilities of $1.6 million and $7.8 million were recognized in revenues during the three months ended March 31, 2018 and 2019 (unaudited), respectively.

As of December 31, 2018, the remaining performance obligations under contracts for which revenues are expected to be recognized over a period of more than one year is $73 million. Management expects to recognize such revenues over a three-year period.

The Company does not disclose remaining performance obligations under its other contracts since contract terms are less than a year and are recognized over a term of less than 12 months.

Note 4. Consolidated Balance Sheets

Inventory and other deferred costs consist of the following (in thousands):

	Year Ended December 31,		Three Months Ended March 31, 2019 (unaudited)
	2017	2018	
Raw materials	$ 822	$2,134	$ 2,245
Other deferred costs	542	1,298	639
Total inventory and other deferred costs	$1,364	$3,432	$ 2,884

Property and equipment, net consists of the following (in thousands):

	Year Ended December 31,		Three Months Ended March 31, 2019 (unaudited)
	2017	2018	
Computer equipment	$ 2,138	$ 6,822	$ 7,093
Computer software	248	202	202
Furniture and fixtures	150	150	157
Machinery and equipment	6,129	7,951	9,508
Leasehold improvements	235	1,016	1,248
Capitalized software costs	—	182	252
Construction in process	710	333	9
	9,610	16,656	18,469
Less: accumulated depreciation and amortization	(3,268)	(5,204)	(6,251)
Property and equipment, net	$ 6,342	$11,452	$ 12,218

Depreciation and amortization expense for the years ended December 31, 2017 and 2018 was $1.2 million and $3.1 million, respectively. Depreciation and amortization expense for the three months ended March 31, 2018 and 2019 (unaudited) was $0.5 million and $1.0 million, respectively.

Accrued and other current liabilities consist of the following (in thousands):

	Year Ended December 31,		Three Months Ended March 31, 2019 (unaudited)
	2017	2018	
Accrued compensation	$1,913	$2,843	$ 3,646
Accrued liabilities	88	59	2,065
Deferred rent	67	99	—
Accrued interest	563	207	19
Deferred revenues	18	3	8
Accrued taxes	108	181	221
Total accrued and other current liabilities	$2,757	$3,392	$ 5,959

Note 5. Fair Value Measurements

Financial assets and liabilities are recorded at fair value. Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability (an exit price) in an orderly transaction between market participants at the reporting date. The authoritative guidance establishes a three-level valuation hierarchy that prioritizes the inputs to valuation techniques used to measure fair value based upon whether such inputs are

observable or unobservable. Observable inputs reflect market data obtained from independent sources, while unobservable inputs reflect market assumptions made by the reporting entity.

The three-level hierarchy for the inputs to valuation techniques is briefly summarized as follows:

Level 1—Unadjusted quoted prices in active markets that are accessible to the reporting entity at the measurement date for identical assets and liabilities.

Level 2—Inputs other than quoted prices in active markets for identical assets and liabilities that are observable either directly or indirectly for substantially the full term of the asset or liability. Level 2 inputs include the following:

- Quoted prices for similar assets and liabilities in active markets
- Quoted prices for identical or similar assets or liabilities in markets that are not active
- Observable inputs other than quoted prices that are used in the valuation of the asset or liabilities (e.g., interest rate and yield curve quotes at commonly quoted intervals)
- Inputs that are derived principally from or corroborated by observable market data by correlation or other means

Level 3—Unobservable inputs for the assets or liabilities (i.e., supported by little or no market activity). Level 3 inputs include management's own assumptions about the assumptions that market participants would use in pricing the asset or liability (including assumptions about risk).

This hierarchy requires the Company to use observable market data, when available, and to minimize the use of unobservable inputs when determining fair value.

The following table represents the fair value hierarchy for the Company's financial assets and financial liabilities measured at fair value on a recurring basis (in thousands):

	As of December 31, 2017			
	Level 1	Level 2	Level 3	Total
Assets				
Money market funds	$21,650	$ —	$ —	$ 21,650
Total assets measured at fair value	$21,650	$ —	$ —	$ 21,650
Liabilities				
Compound derivative liability	—	—	$ (671)	$ (671)
Convertible preferred stock warrants liability	$ —	$ —	292	292
Total liabilities measured at fair value	$ —	$ —	$ (379)	$ (379)

	As of December 31, 2018			
	Level 1	Level 2	Level 3	Total
Assets				
Money market funds	$18,142	$ —	$ —	$ 18,142
Total assets measured at fair value	$18,142	$ —	$ —	$ 18,142
Liabilities				
Convertible preferred stock warrants liability	$ —	$ —	$ 683	$ 683
Total liabilities measured at fair value	$ —	$ —	$ 683	$ 683

	As of March 31, 2019 (unaudited)			
	Level 1	Level 2	Level 3	Total
Assets				
Money market funds	$28,698	$ —	$ —	$28,698
Total assets measured at fair value	$28,698	$ —	$ —	$28,698
Liabilities				
Convertible preferred stock warrants liability	$ —	$ —	$ 817	$ 817
Total liabilities measured at fair value	$ —	$ —	$ 817	$ 817

The fair value of the compound derivative instrument has been estimated at the date of inception in June 2017 and at each subsequent consolidated balance sheet date using a hybrid method that combines probability-weighted and with-or-without methods using unobservable inputs, which are classified as Level 3 within the fair value hierarchy. The primary inputs for this approach included the probability of achieving various settlement scenarios that provide the lenders the right or the obligation to receive cash or a variable number of shares upon the completion of a capital transaction. The probability assumptions related to estimating various settlement scenarios as of December 31, 2017 and 2018, and the inception date ranged between 0.2% and 70%, and a discount rate of 35.1% was applied to estimated future cash flows.

After the initial measurement, changes in the fair value of this compound derivative were recorded in other income (expense), net. The net derivative liability was reported within accrued and other current liabilities in the Company's consolidated balance sheets.

The Black-Scholes option-pricing model was used to estimate the fair value of the convertible preferred stock warrants. Under this option-pricing model, convertible preferred stock warrants were valued by creating a series of call options with exercise prices based on the liquidation preferences and conversion terms of each equity class. The values of the redeemable convertible preferred stock and common stock are inferred by analyzing these options.

The fair value of each convertible preferred stock warrant was estimated on the date of grant using the Black-Scholes option-pricing model with the assumptions described below. For the periods indicated the Company has limited historical volatility information available, and the expected volatility was based on actual volatility for comparable public companies projected over the expected terms of the warrants. The Company did not apply a forfeiture rate to the warrants as there is not enough historical information available to estimate such a rate. The risk-free interest rate was based on the U.S. Treasury yield curve at the time of the grant over the expected term of the warrants.

	Year Ended December 31,		Three Months Ended March 31, 2019
	2017	2018	(unaudited)
Expected term (in years)	6.75 - 7.50	5.17 - 7.0	5.50 - 7.00
Volatility	56.07% - 69.87%	55.56% - 56.42%	56.89% - 57.24%
Risk-free interest rate	1.97% - 2.33%	2.58% - 3.01%	2.25% - 2.31%
Dividend yield	0%	0%	0%

The following table sets forth a summary of the changes in the fair value of the Company's Level 3 financial instruments (in thousands):

	Warrant Liability	Derivative Asset	Derivative Liability
Balance—December 31, 2016	$ 59	$ —	$ —
Issuance of convertible preferred stock warrants	169	—	—
Initial fair value of derivative liability	—	—	509
Change in fair value	64	—	162
Balance—December 31, 2017	292	—	671
Initial fair value of derivative asset	—	623	—
Change in fair value	391	(97)	(671)
Elimination as a result of debt extinguishment	—	(526)	—
Balance—December 31, 2018	683	—	—
Change in fair value	134	—	—
Balance—March 31, 2019 (unaudited)	$ 817	$ —	$ —

Note 6. Borrowings

Amounts outstanding under the Company's financing arrangements consisted of the following (in thousands):

	Year Ended December 31,		Three Months Ended March 31,
	2017	2018	2019 (unaudited)
Credit agreement			
Term Loan	$ 753	$ —	$ —
Revolving Loan	5,000	5,000	—
Convertible Promissory Note	12,225	—	—
Growth Capital Loan	—	—	20,000
Total principal payments due	17,978	5,000	20,000
Less reduction in carrying value	(472)	(4)	(1,059)
Total amounts outstanding	17,506	4,996	18,941
Less: Current portion	(17,506)	(4,996)	—
Long-Term portion	$ —	$ —	$ 18,941

The repayment schedule relating to the Company's long-term debt as of March 31, 2019 is as follows (in thousands):

	March 31, (unaudited)
2019 (remaining nine months)	$ —
2020	4,395
2021	6,463
2022	7,212
2023	1,930
Thereafter	—
Total	$ 20,000

Term Loan

In September 2014, the Company entered into a loan and security agreement with Silicon Valley Bank (the "Term Loan"), to borrow up to $3.0 million under an equipment loan that will be secured with the equipment financed. On October 3, 2014, the Company borrowed $2.4 million under this loan agreement. The Term Loan required 12 interest-only payments, followed by 36 equal monthly installments of principal, plus interest, which began on October 3, 2015.

In connection with the Term Loan, the Company issued to the bank a 10-year warrant to purchase 22,489 shares of the Company's Series B redeemable convertible preferred stock (see Note 9).

The estimated fair value of the warrants upon draw down, of $0.1 million was based on the Black-Scholes option-pricing model. The Company recorded the fair value of the warrant at issuance as a reduction in the debt-carrying value and as a warrant liability. The debt-carrying value reduction is being accreted using the effective interest method as additional interest expense over the contractual period of four years for the Term Loan.

On September 30, 2018, this Term Loan was repaid in full.

Revolving Loan

In June 2017, the Company entered into a $10.0 million revolving loan and security agreement (the "Revolving Loan"). Borrowings under the Revolving Loan bear an interest rate of prime, plus 6.75%. The Revolving Loan also has a 5.5% end of term loan payment on the highest outstanding principal amount. The Revolving Loan requires monthly interest-only payments until the maturity date. The Revolving Loan's original maturity date was December 31, 2018, and in December 2018 the maturity date was further extended until March 22, 2019 (see Note 16). Upon determining that the change in cash flows between the previous and current credit facility was not greater than 10%, the Company accounted for the transaction as a debt modification.

As of December 31, 2017 and 2018, the Company's outstanding principal under the Revolving Loan was $5.0 million and $5.0 million was available to borrow.

In connection with the Revolving Loan, the Company issued a warrant to purchase up to 62,096 shares of the Company's Series C redeemable convertible preferred stock (see Note 9).

The estimated fair value of the warrant upon draw down, of $0.1 million was based on the Black-Scholes option-pricing model. The Company recorded the fair value of the warrant at issuance as a reduction in the debt-carrying value and as a warrant liability. The debt-carrying value reduction is being accreted using the effective interest method as additional interest expense over the contractual period of 1.5 years for the Revolving Loan.

The Revolving Loan had an effective interest rate of 19.22% per year. The Revolving Loan interest expense for the years ended December 31, 2017 and 2018, was $0.4 million and $0.9 million, respectively.

The Company accrued $0.1 million and $0.2 million, as of December 31, 2017 and 2018, respectively, related to accretion of final payment due at maturity per agreement using the effective interest rate method.

On March 22, 2019, this Revolving Loan was repaid in full.

Growth Capital Loan (unaudited)

On March 22, 2019, the Company entered into a growth capital loan with TriplePoint Capital LLC to provide for a $20.0 million growth capital loan facility and as of March 31, 2019 had drawn down the full $20.0 million available under the facility. The Company used $5.3 million of the growth capital loan facility to

repay, in its entirety, all amounts outstanding under the Revolving Loan. Borrowings under the growth capital loan bear interest at a floating rate of prime rate plus 5.00% for borrowings up to $15.0 million and the prime rate plus 6.50% for borrowing greater than $15.0 million; provided, however, that in an event of default, as defined in the loan and security agreement, the interest rate applicable to borrowings under such agreement will be increased by 5.0%. Under the agreement, the Company is required to make monthly interest-only payments through April 1, 2020 and is required to make 36 equal monthly payments of principal, plus accrued interest, from April 1, 2020 through March 1, 2023, when all unpaid principal and interest becomes due and payable. The Company may voluntarily prepay all, but not part, of the outstanding principal at any time prior to the maturity date, subject to a prepayment fee of 1% of the outstanding balance, if prepaid in months one through 12 of the loan term. If prepaid after month 12 of the loan term of any growth capital loan, no additional prepayment premium shall be due. In addition to the final payment, the Company will pay an amount equal to 2.75% of each principal amount drawn under this growth capital loan facility. In connection with the growth capital loan facility, the Company issued a warrant to purchase 65,502 shares of common stock to the lender at an exercise price of $9.16 per share. The Company recorded the issuance-date fair value of the warrant of $0.6 million and fees paid to the lender of $0.3 million as a debt discount which is amortized over the term of the growth capital loan using the effective interest rate method.

Upon issuance, the growth capital loan had an effective interest rate of 15.23% per year.

Convertible Notes

On June 29, 2017, the Company entered into a convertible promissory note agreement with certain existing redeemable convertible preferred stockholders and third parties (the “Investors”) for the issuance of convertible promissory notes with a face value of $12.2 million (the “Convertible Notes”). Under the terms of the Convertible Notes agreement, the Convertible Notes bear interest of 8% per annum, with a maturity date of June 28, 2018. In the event that the Company issued and sold shares of its equity securities (the “Equity Securities”) to Investors on or before the maturity date in an equity financing with total proceeds to the Company of not less than $10 million (including the conversion of the Convertible Notes or other convertible securities issued for capital raising purposes) (a “Qualified Financing”), then the outstanding principal amount of the Convertible Notes and any unpaid accrued interest would have automatically converted in whole without any further action by the holder into such Equity Securities sold in the Qualified Financing at a conversion price equal to the price paid per share for Equity Securities by the Investors in the Qualified Financing multiplied by 0.8. If the Company consummated a change of control while the Convertible Notes remained outstanding, the Company would have repaid the holders in cash an amount equal to 150% of the outstanding principal amount of the Convertible Notes, plus any unpaid accrued interest on the original principal. The Convertible Notes had customary events of default.

Certain conversion and redemption features of the Convertible Notes met the requirements for separate accounting and were accounted for as a single, compound derivative instrument (see Note 10). The compound derivative instrument was recorded at fair value at inception and was subject to remeasurement to fair value at each consolidated balance sheet date, with any changes in fair value recognized in the consolidated statements of operations. The estimated fair value of the compound derivative instrument at issuance was recorded as a reduction in the carrying value of the Convertible Notes and as a single compound derivative liability. The Convertible Notes carrying value reduction was accreted using the effective interest method as interest expense over the Convertible Notes contractual period of one year. The Convertible Notes had an effective interest rate of 12.69% per year.

On May 31, 2018, the original maturity date for the Convertible Notes was extended to June 28, 2019 (previously June 28, 2018). The maturity date extension was deemed substantial and was accounted for as a debt extinguishment under ASC 470, *Debt*. In connection with the debt extinguishment on May 31, 2018, the fair value of the Convertible Notes was allocated between the carrying amount of the Convertible Notes and accrued interested of $13.1 million, a compound derivative asset of $0.6 million, and an equity component of

$3.9 million, which was credited to additional paid-in capital within the consolidated statements of redeemable convertible preferred stock and stockholders' deficit. A $3.3 million loss on debt extinguishment was also recorded in the accompanying consolidated statements of operations. The new carrying value of the Convertible Notes was accreted using the effective interest method as interest expense over the new contractual period of 1.1 years.

On August 20, 2018, the maturity date for the Convertible Notes was changed to September 20, 2018 (previously June 28, 2019). The term change was deemed substantial and was accounted for as a debt extinguishment under ASC 470. In connection with the debt extinguishment on August 20, 2018, the fair value of the Convertible Notes was allocated between the new carrying amount of the Convertible Notes and accrued interest of $13.4 million, and an equity component of $0.8 million, which resulted in an additional credit to additional paid-in capital. A $0.8 million loss on debt extinguishment was also recorded in the accompanying consolidated statements of operations. The new carrying value of Convertible Notes was accreted using the effective interest method as interest expense over the new contractual period of one month.

On September 20, 2018, upon the maturity of the Convertible Notes, the carrying amount, including accrued interest of $13.4 million was converted into 1,667,997 shares of the Company's Series C redeemable convertible preferred stock at a conversion price equal to $8.052 per share. No gain or loss was recorded on the conversion.

The interest expense on the Convertible Notes for the years ended December 31, 2017 and 2018, was $0.7 million and $0.9 million, respectively.

Note 7. Income Taxes

For financial reporting purposes, loss before provision for income taxes, includes the following components (in thousands):

	Year Ended December 31,	
	2017	2018
Domestic	$ (23,613)	$ (19,897)
Foreign	20	18
Loss before income taxes	$ (23,593)	$ (19,879)

Provision for Income Taxes

The provision for income taxes consists of the following (in thousands):

	Year Ended December 31,	
	2017	2018
Current:		
Federal	$ —	$ —
State	1	2
Foreign	4	5
Total current	5	7
Provision for income taxes	$ 5	$ 7

Income tax provision related to continuing operations differ from the amounts computed by applying the statutory income tax rate of 34% to pretax loss in 2017 and 21% in 2018 as follows (in thousands):

U.S. Federal provision	Year Ended December 31, 2017	2018
At statutory rate	$ (8,022)	$ (4,175)
State taxes	(1,674)	(589)
Valuation allowance	(2,109)	4,188
Foreign tax differential	(3)	2
Rate impact due to tax reform	11,934	—
Research and development credit	(547)	(564)
Debt extinguishment	—	871
Other	426	274
Total	$ 5	$ 7

Tax Law Changes

The U.S. Tax Cuts and Jobs Act (the "Tax Act") was enacted on December 22, 2017. The Tax Act reduced the U.S. federal corporate tax rate from 35% in 2017 to 21% in 2018, required companies to pay a onetime transition tax on earnings of certain foreign subsidiaries that were previously tax deferred, and created new taxes on certain foreign sourced earnings. For the year ended December 31, 2017, the Company remeasured its deferred tax assets and liabilities based on the change in the federal rate to 21%. At December 31, 2018, the Company had completed its accounting for the Tax Act, which, other than the decrease in its gross deferred tax assets, did not have a material impact on the Company's financial statements.

Deferred Tax Assets and Liabilities

Deferred income taxes reflect the net tax effects of loss and credit carryforwards and temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. Significant components of the Company's deferred tax assets for federal and state income taxes are as follows (in thousands):

	Year Ended December 31, 2017	2018
Deferred tax assets:		
Net operating loss carryforwards	$ 22,783	$ 22,441
Research and development credits	3,535	4,634
Deferred revenue	1,475	4,839
Fixed assets	(875)	(751)
Accruals and reserves	434	460
Stock-based compensation	167	297
Inventory	43	42
Other intangibles	518	458
Other	(140)	3
Total gross deferred tax assets	27,940	32,423
Less: Valuation allowance	(27,940)	(32,423)
Total deferred tax assets	$ —	$ —

Realization of our deferred tax assets is dependent upon future earning, if any, the timing and amount of which are uncertain. Because of our lack of U.S. earnings history, the net U.S. deferred tax assets have been fully

offset by a valuation allowance. The valuation allowance decreased by $1.8 million for the year ended December 31, 2017, and increased by $4.5 million for the year ended December 31, 2018.

Net Operating Loss and Tax Credit Carryforwards

As of December 31, 2018, the Company had net operating loss carryforwards for federal income tax purposes of approximately $87.0 million, portions of which will begin to expire in 2031. The Company had a total state net operating loss carryforward of approximately $48.6 million, which will begin to expire in 2031. Utilization of some of the federal and state net operating loss and credit carryforwards are subject to annual limitations due to the "change in ownership" provisions of the Internal Revenue Code of 1986, as amended, and similar state provisions. The annual limitations may result in the expiration of net operating losses and credits before utilization for federal and state income tax purposes, respectively. The federal and state net operating loss carryforwards begin expiring in 2032, if not utilized.

The Company has federal credits of approximately $2.8 million, which will begin to expire in 2031 and state research credits of approximately $3.0 million which have no expiration date. These tax credits are subject to the same limitations discussed above.

Unrecognized Tax Benefits

The Company has incurred net operating losses since inceptions and does not have any significant unrecognized tax benefits. The Company's policy is to include interest and penalties related to unrecognized tax benefits, if any, within the provision for taxes in the consolidated statements of operations. If the Company is eventually able to recognize its uncertain positions, its effective tax rate would be reduced. The Company currently has a full valuation allowance against its net deferred tax asset, which would impact the timing of the effective tax rate benefit should any of these uncertain tax positions be favorably settled in the future. Any adjustments to the Company's uncertain tax positions would result in an adjustment of its net operating loss or tax credit carryforwards rather than resulting in a cash outlay.

The Company files income tax returns in the U.S. federal and various state income tax returns. Because of net operating losses and research credit carryovers, substantially all of the Company's tax years remain open to examination.

The Company has the following activity relating to unrecognized tax benefits (in thousands):

	As of December 31,	
	2017	2018
Beginning balance	$ 708	$ 917
Gross increase—tax position in current period	209	275
Ending balance	$ 917	$ 1,192

Although it is reasonably possible that certain unrecognized tax benefits may increase or decrease within the next 12 months due to tax examination changes, settlement activities, expirations of statute of limitations, or the impact on recognition and measurement considerations related to the results of published tax cases or other similar activities, the Company does not anticipate any significant changes to unrecognized tax benefits over the next 12 months. During the years ended December 31, 2017 and 2018, no significant interest or penalties were required to be recognized relating to unrecognized tax benefits.

Note 8. Common Stock Warrants

In connection with the sale of Series A redeemable convertible preferred stock in August 2011, the Company issued a warrant to purchase 188,643 shares of common stock to an investor who purchased Series A

redeemable convertible preferred stock in August 2011 at an exercise price of $0.04 per share. The common stock warrant expires in August 2021 and remained outstanding as of December 31, 2018.

In connection with the growth capital loan agreement (unaudited, see Note 6), the Company issued a warrant to purchase 65,502 shares of common stock to the lender at an exercise price of $9.16 per share. The Company recorded the issuance-date fair value of the warrant of $0.6 million in equity as the warrant met all criteria for equity classification.

Note 9. Convertible Preferred Stock Warrants

In September 2014, in connection with the Term Loan (see Note 6), the Company issued a warrant to purchase 22,489 shares of its Series B redeemable convertible preferred stock at an exercise price of $4.60 per share. The Series B convertible preferred stock warrant expires in September 2024 and remained outstanding as of March 31, 2019 (unaudited).

As of December 31, 2018, the remaining term of the Series B convertible preferred stock warrant was 6.75 years. The estimated fair value of the Series B convertible preferred stock warrant on the date of issuance of $0.1 million was recorded as a debt reduction. As of the issuance date, the fair value of the Series B convertible preferred stock warrant was calculated using the Black-Scholes option-pricing model and was based on a contractual term of ten years, a risk-free interest rate of 2.52%, expected volatility of 66.53%, and 0% expected dividend yield.

As of March 31, 2019 (unaudited), the remaining term of the Series B convertible preferred stock warrant was 5.5 years.

In June 2017, as additional consideration for the Revolving Loan (see Note 6), the Company issued a warrant to purchase up to 62,096 shares of its Series C redeemable convertible preferred stock at an exercise price of $8.052, subject to certain adjustments, such as any stock splits, stock dividends, recapitalizations, reclassifications, combinations, or similar transactions.

The remaining term of the Series C convertible preferred stock warrant is the greater of (i) seven years from June 28, 2017, or (ii) five years from the effective date of the Company’s initial public offering.

The estimated fair value of the Series C convertible preferred stock warrant on the date of issuance of $0.1 million was recorded as a debt reduction. As of the issuance date, the fair value of the Series C convertible preferred stock warrant was calculated using the Black-Scholes option-pricing model and was based on a contractual term of seven years, a risk-free interest rate of 1.97%, expected volatility of 64.33%, and 0% expected dividend yield.

At initial recognition, the convertible preferred stock warrants were recorded at their estimated fair values and were subject to remeasurement at each consolidated balance sheet date, with changes in fair value recognized as a component of net income. As of December 31, 2017 and 2018 and March 31, 2019 (unaudited), the fair values of the convertible preferred stock warrants were calculated to be $0.3 million, $0.7 million, and $0.8 million, respectively.

Note 10. Compound Derivative Instrument

Certain conversion and redemption features embedded in the Convertible Notes (see Note 6) were bifurcated from the notes and accounted for as separate compound derivative instrument. The Company remeasured the value of the compound derivative instrument on a recurring basis, with the change in fair value reflected as other income (expense) in the consolidated statements of operations. The compound derivative instrument was recorded as a compound derivative liability at fair value, which was $0.5 million as of the issuance date and $0.7 million and $0 as of December 31, 2017 and 2018, respectively (see Note 5).

Upon modification of the Convertible Notes on August 20, 2018 (see Note 6), the compound derivative asset was eliminated.

Note 11. Commitments and Contingencies

Operating Lease Obligations

In February 2015, the Company entered into a noncancelable operating lease for approximately 31,280 square feet of office space, which expires on November 30, 2020.

The Company recognizes rent expense on a straight-line basis over the noncancelable lease term. The Company's rent expense was $1.1 million for the years ended December 31, 2017 and 2018.

The Company adopted ASC 842 as of January 1, 2019. In determining the present value of lease payments, the Company uses its incremental borrowing rate based on the information available at the lease commencement date if the rate implicit in the lease is not readily determinable. At the date of adoption of ASC 842, the Company determined the amounts of lease liability using a discount rate of 8%, which represents the Company's incremental borrowing rate. The Company determines its incremental borrowing rate for lease liability using its current borrowing rate, adjusted for various factors including level of collateralization and term. Lease cost for the three-month period ended March 31, 2019 (unaudited) was $0.2 million. Cash paid for operating lease liabilities, included in cash flow from operating activities in the Consolidated Statement of Cash Flows, was $0.3 million for the three-month period ended March 31, 2019 (unaudited). As of March 31, 2019 (unaudited), the remaining lease term for the lease is 1.7 years.

Future minimum lease payments at December 31, 2018 under this noncancelable operating lease were as follows (in thousands):

	Amount
2019	$1,091
2020	1,030
Total future minimum lease payments	$2,121

Future minimum lease payments at March 31, 2019 (unaudited) under the lease were as follows (in thousands):

	Amount
2019 (excluding the three months ended March 31, 2019)	$ 824
2020	1,030
Total future minimum lease payments	1,854
Less: imputed interest	(115)
Present value of future minimum lease payments	1,739
Less: current portion of operating lease liability	(1,001)
Operating lease liabilities - noncurrent	$ 738

Contingencies

The Company is subject to claims and assessments from time to time in the ordinary course of business. Accruals for litigation and contingencies are reflected in the consolidated financial statements based on management's assessment, including the advice of legal counsel, of the expected outcome of litigation or other dispute resolution proceedings and/or the expected resolution of contingencies. Liabilities for estimated losses

are accrued if the potential losses from any claims or legal proceedings are considered probable and the amounts can be reasonably estimated. Significant judgment is required in both the determination of probability of loss and the determination as to whether the amount can be reasonably estimated. Accruals are based only on information available at the time of the assessment due to the uncertain nature of such matters. As additional information becomes available, management reassesses potential liabilities related to pending claims and litigation and may revise its previous estimates, which could materially affect the Company's consolidated results of operations in a given period. As of December 31, 2017 and 2018 and March 31, 2019 (unaudited), the Company was not involved in any material legal proceedings.

Indemnification

In the normal course of business, the Company enters into contracts and agreements that contain a variety of representations and warranties and provide for general indemnifications. The Company's exposure under these agreements is unknown because it involves claims that may be made against the Company in the future, but that have not yet been made. To date, the Company has not paid any claims or been required to defend any action related to its indemnification obligations. However, the Company may record charges in the future as a result of these indemnification obligations.

Note 12. Redeemable Convertible Preferred Stock

The Company's certificate of incorporation, as amended, authorizes it to issue 75,238,150 shares of $0.0001 par value redeemable convertible preferred stock, with 31,250,000 shares of preferred stock designated as Series A redeemable convertible preferred stock, 19,288,150 shares of redeemable preferred stock designated as Series B redeemable convertible preferred stock, and 24,700,000 shares of preferred stock designated as Series C redeemable convertible preferred stock.

Redeemable convertible preferred stock at December 31, 2017, consisted of the following (in thousands, except share and per share data):

As of December 31, 2017

Series	Shares Authorized	Shares Outstanding	Liquidation Amount	Issuance Costs	Original Issuance Price
Series A redeemable convertible preferred stock	31,250,000	7,812,497	$ 20,500	$ 82	$ 2.624
Series B redeemable convertible preferred stock	19,288,150	4,799,548	22,078	31	4.600
Series C redeemable convertible preferred stock	18,000,000	4,194,700	33,776	89	8.052
	68,538,150	16,806,745	$ 76,354	$ 202	

Redeemable convertible preferred stock at December 31, 2018, consisted of the following (in thousands, except share and per share data):

As of December 31, 2018

Series	Shares Authorized	Shares Outstanding	Liquidation Amount	Issuance Costs	Original Issuance Price
Series A redeemable convertible preferred stock	31,250,000	7,812,497	$ 20,500	$ 82	$ 2.624
Series B redeemable convertible preferred stock	19,288,150	4,799,548	22,078	31	4.600
Series C redeemable convertible preferred stock	24,700,000	5,862,697	47,206	110	8.052
	75,238,150	18,474,742	$ 89,784	$ 223	

Redeemable convertible preferred stock at March 31, 2019, consisted of the following (in thousands, except share and per share data):

As of March 31, 2019 (unaudited)

Series	Shares Authorized	Shares Outstanding	Liquidation Amount	Issuance Costs	Issuance Price
Series A redeemable convertible preferred stock	31,250,000	7,812,497	$ 20,500	$ 82	$ 2.624
Series B redeemable convertible preferred stock	19,288,150	4,799,548	22,078	31	4.600
Series C redeemable convertible preferred stock	24,700,000	5,862,697	47,206	110	8.052
	75,238,150	18,474,742	$ 89,784	$ 223	

The rights and preferences of holders of the redeemable convertible preferred stock are as follows:

Dividends

Holders of the redeemable convertible preferred stock are entitled to receive, prior and in preference to any declaration or payments of any dividend on the common stock, noncumulative dividends out of any assets legally available at the per annum rate of 8% of the original issuance price of the redeemable convertible preferred stock, when and if declared by the board of directors.

No dividends shall be paid on any common stock until dividends to the holders of the redeemable convertible preferred stock have been paid. After payment of dividends to holders of the redeemable convertible preferred stock, any additional dividends, when, as, and if declared by the board of directors, shall be distributed among all holders of common stock and all holders of redeemable convertible preferred stock pro rata based on the number of shares of common stock held by each holder on an as-converted basis. As of December 31, 2018, no dividends have been declared or paid to the holders of redeemable convertible preferred stock.

Voting Rights

Each share of redeemable convertible preferred stock has voting rights equal to an equivalent number of shares of common stock into which it is convertible and votes together as one class with the common stock. As

long as 250,000 shares of redeemable convertible preferred stock remain outstanding, the Company must obtain approval from the holders of a majority of the then-outstanding redeemable convertible preferred stock in order to alter the certificate of incorporation; increase or decrease the authorized number of shares of common stock or redeemable convertible preferred stock; authorize or designate any new class or series of stock or any other securities convertible into equity securities of the Company ranking on parity with or senior to the redeemable convertible preferred stock in redemption, liquidation preference, voting or dividend rights, or any increase in the authorized or designated number of any such class or series; effect any liquidation, dissolution, winding-up, recapitalization, reorganization, or change in control of the Company; change the number of authorized directors of the Company; or declare or pay any dividends on the common stock.

Liquidation Rights

In the event of any liquidation, dissolution, or winding-up of the Company, either voluntary or involuntary, holders of the redeemable convertible preferred stock shall be entitled to receive, prior to and in preference to any distribution of any of the assets to the holders of the common stock of the Company, an amount per share equal to the sum of the original issue price of the redeemable convertible preferred stock and all declared and unpaid dividends on such shares of redeemable convertible preferred stock. If upon the occurrence of such an event, the assets and funds distributed among the holders of the redeemable convertible preferred stock are insufficient to permit the payment to such holders of the redeemable convertible preferred stock, then the entire assets and funds of the Company legally available for distribution shall be distributed ratably among the holders of the redeemable convertible preferred stock in proportion to the full amount such holders are otherwise entitled to have received pursuant to the entitlement as noted above.

After the payment in full to holders of the redeemable convertible preferred stock as noted above, the remaining assets, if any, shall be distributed ratably to the holders of the common stock.

Conversion rights

Each share of redeemable convertible preferred stock is convertible, at the option of the holder, at any time after the date of issuance of such share for such redeemable convertible preferred stock. Each share of redeemable convertible preferred stock shall be convertible into the number of shares of common stock determined by dividing the original issuance price by the conversion price. The initial conversion price for each share of redeemable convertible preferred stock is the original issuance price for such share of redeemable convertible preferred stock.

Each share of redeemable convertible preferred stock automatically converts into the number of shares of common stock into which such shares are convertible at the then-effective conversion ratio (i) at any time upon the affirmative election of the holders of a majority of the outstanding shares of the redeemable convertible preferred stock or (ii) upon closing of a public offering of common stock in which the gross cash proceeds to the Company are at least $30.0 million.

Note 13. Stockholders' Deficit

The Company's certificate of incorporation, as amended, authorizes it to issue 105,700,000 shares of $0.0001 par value common stock. Common stockholders are entitled to dividends, subject to redeemable convertible preferred stock dividends, when and if declared by the board of directors. There have been no dividends declared to date. The holder of each common share is entitled to one vote.

Note 14. Stock Option Plan

In 2011, the Company established its 2011 stock option plan (the "2011 Plan") that provides for the granting of stock options to employees and nonemployees of the Company. Under the 2011 Plan, the Company has the

ability to issue incentive stock options ("ISOs"), nonstatutory stock options, stock appreciation rights, restricted stock awards, and restricted stock unit awards. Options under the 2011 Plan may be granted for periods of up to 10 years. The ISOs will be granted at a price per share not less than the fair value at the date of grant. The exercise price of an ISO granted to a 10% stockholder shall not be less than 110% of the estimated fair value of the shares on the date of grant, as determined by the board of directors. Options granted to new hires generally vest over a four-year period, with 25% vesting at the end of one year and the remaining vesting monthly thereafter; options granted as merit awards generally vest monthly over a four-year period. At December 31, 2018 and March 31, 2019 (unaudited), there were 4,647,839 shares and 5,450,683 shares, respectively, of common stock available for issuance under the 2011 Plan.

Early Exercise of Stock Options

For stock option grants issued prior to December 31, 2015, the Company allowed employees to exercise options granted under the 2011 Plan prior to vesting. The unvested shares are subject to the Company's repurchase rights at the original purchase price. Initially, the proceeds were recorded as an accrued liability from the early exercise of stock options and reclassified to common stock as the Company's repurchase rights lapse. There were 2,213 and 262 unvested shares subject to the Company's repurchase rights as of December 31, 2017 and 2018, respectively. There were 1,577 unvested shares subject to the Company's repurchase rights as of March 31, 2019 (unaudited).

	Outstanding Options			
(in thousands, except share and per share data)	Number of Shares	Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Term (in years)	Aggregate Intrinsic Value
Balance—December 31, 2016	2,112,394	$ 1.76	6.41	$ 2,451
Options granted	898,510	2.44		
Options exercised	(30,625)	2.12		15
Options canceled	(95,752)	3.20		
Balance—December 31, 2017	2,884,527	1.92	6.61	5,860
Options authorized				
Options granted	1,386,464	5.68		
Options exercised	(34,426)	2.80		96
Options canceled	(126,435)	2.96		
Balance—December 31, 2018	4,110,130	3.16	6.94	24,716
Options authorized	—			
Options granted	361,500	9.16		
Options exercised	(81,009)	4.36		
Options canceled	(8,737)	3.44		
Balance—March 31, 2019 (unaudited)	4,381,884	3.60	6.94	$ 41,980
Options vested and expected to vest as of December 31, 2018	4,110,138	3.16	6.94	24,716
Options vested and exerciseable as of December 31, 2018	2,322,492	1.80	5.12	17,043
Options vested and expected to vest as of March 31, 2019 (unaudited)	4,381,884	3.60	6.94	41,980
Options vested and exercisable as of March 31, 2019 (unaudited)	2,374,031	1.84	5.00	26,923

The weighted-average grant date fair values of options granted in the years ended December 31, 2017 and 2018, were $2.44 and $5.68, respectively. There were no options granted in the three months ended March 31,

2018 (unaudited). The weighted-average grant date fair values of options granted in the three months ended March 31, 2019 (unaudited) was $7.76. The total fair values of options vested during the years ended December 31, 2017 and 2018, were $0.6 million and $0.8 million, respectively. The total fair values of options vested during March 31, 2018 and 2019 (unaudited) were $0.1 million and $0.4 million, respectively. As of March 31, 2019 (unaudited), the unrecognized stock-based compensation of unvested options was $9.3 million, which is expected to be recognized over a weighted-average period of 3.5 years.

The Company estimated the fair value of stock options using the Black-Scholes option-pricing model. The fair value of stock options is recognized on a straight-line basis over the requisite service periods of the awards. The fair value of stock options was estimated using the following weighted-average assumptions:

	Year Ended December 31,		Three Months Ended March 31,
	2017	2018	2019 (unaudited)
Expected term (in years)	5.97 - 6.95	5.98 - 6.35	6.87
Volatility	56.05 - 65.78%	56.20 - 65.91%	56.20%
Risk-free interest rate	1.88 - 2.10%	2.77 - 2.87%	2.49% - 2.52%
Dividend yield	0%	0%	0%

Expected Term

The expected term is calculated using the simplified method, which is available if there is insufficient historical data about exercise patterns and post-vesting employment termination behavior. The simplified method is based on the vesting period and the contractual term for each grant, or for each vesting tranche for awards with graded vesting. The midpoint of the vesting date and the maximum contractual expiration date is used as the expected term under this method. For awards with multiple vesting tranches, the times from grant until the midpoints for each of the tranches may be averaged to provide an overall expected term.

Expected Volatility

The Company used an average historical stock price volatility of a peer group of publicly traded companies to be representative of its expected future stock price volatility, as the Company did not have any trading history for its common stock. For purposes of identifying these peer companies, the Company considered the industry, stage of development, size, and financial leverage of potential comparable companies. For each grant, the Company measured historical volatility over a period equivalent to the expected term.

Risk-Free Interest Rate

The risk-free interest rate is based on the implied yield currently available on U.S. Treasury zero-coupon issues with remaining terms equivalent to the expected term of a stock award.

Expected Dividend Rate

The Company has not paid and does not anticipate paying, any dividends in the near future. Accordingly, the Company has estimated the dividend yield to be zero.

As of March 31, 2019 (unaudited), the Company had outstanding 67,417 stock options with performance vesting conditions granted to several of its employees. The awards are subject to two vesting criteria: (i) a time-based service criterion, and (ii) a performance criterion of an initial public offering. Until both conditions have been met, shares are not considered to be vested. As of March 31, 2019 (unaudited), the awards' underlying conditions were not considered probable of occurrence and, therefore, no compensation cost was recognized. If an initial public offering had occurred on March 31, 2019 (unaudited), the Company would have recognized $0.9 million of stock-based compensation expense for all such outstanding options.

The following is a summary of stock-based compensation expense by function (in thousands):

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
Costs of revenues	$ 74	$ 177	$ 24	$ 85
Research and development	225	429	64	164
Selling, general, and administrative	454	711	81	360
Total stock-based compensation expense	$753	$1,317	$ 169	$ 609

Note 15. Net Loss per Share Attributable to Common Stockholders

Basic net loss per share is computed by dividing the net loss by the weighted-average number of common shares outstanding for the period. Because the Company reported a net loss for 2017 and 2018 and the three months ended March 31, 2018 and 2019, the number of shares used to calculate diluted net loss per common share is the same as the number of shares used to calculate basic net loss per common share for those periods presented because the potentially dilutive shares would have been antidilutive if included in the calculation.

The following table sets forth the computation of basic and diluted net loss per share attributable to common stockholders (in thousands, except share and per share data):

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
Numerator:				
Net loss attributable to common stockholders	$ (23,598)	$ (19,886)	$ (5,375)	$ (5,685)
Denominator:				
Weighted-average shares outstanding	3,035,791	3,063,516	3,051,809	3,091,504
Less weighted-average shares subject to repurchase	(4,155)	(359)	(228)	(162)
Weighted-average shares outstanding used in computing net loss per share attributable to common stockholders—basic and diluted	3,031,636	3,063,157	3,051,581	3,091,342
Net loss per share attributable to common stockholders—basic and diluted	$ (7.78)	$ (6.49)	$ (1.76)	$ (1.84)

The following outstanding shares of potentially dilutive securities were excluded from the computation of diluted net loss per share attributable to common stockholders for the periods presented because including them would have been antidilutive:

	Year Ended December 31,		Three Months Ended March 31,	
	2017	2018	2018	2019
			(unaudited)	
Redeemable convertible preferred stock	16,806,746	18,474,742	16,806,746	18,474,742
Conversion of Convertible Notes(1)	1,580,151	—	1,610,100	—
Common stock warrant	188,643	188,643	188,643	254,145
Series B preferred stock warrant	22,489	22,489	22,489	22,489
Series C preferred stock warrant	62,096	62,096	62,096	62,096
Options to purchase common stock	2,884,527	4,110,130	2,836,878	4,381,884
Unvested early exercised common stock options	2,213	262	520	1,016
Total	21,546,865	22,858,362	21,527,472	23,196,372

(1) Calculated as $12.2 million principal and $0.5 million accrued but unpaid interest as of December 31, 2017. Calculated as $12.2 million principal and $0.7 million accrued but unpaid interest as of March 31, 2018 (unaudited).

Unaudited Pro Forma Net Loss per Share

Unaudited pro forma basic and diluted net loss per share was computed to give effect to the automatic one-for-one conversion of all outstanding shares of redeemable convertible preferred stock into shares of common stock in connection with a qualified initial public offering, using the if-converted method as though the conversion had occurred as of the beginning of the period presented or the date of issuance.

Unaudited pro forma basic and diluted loss per share is computed as follows (in thousands, except share and per share data):

	Year Ended December 31, 2018	Three Months Ended March 31, 2019 (unaudited)
Numerator:		
Net loss attributable to common stockholder	$ (19,886)	$ (5,685)
Adjust: Change in fair value of convertible preferred stock warrants	391	134
Pro forma net loss	$ (19,495)	$ (5,551)
Denominator:		
Weighted-average shares outstanding used in computing net loss per share attributable to common stockholders—basic and diluted	3,063,157	3,091,342
Adjust: Conversion of redeemable convertible preferred stock	17,231,743	18,474,742
Adjust: Conversion of common stock warrants	188,643	188,643
Weighted-average shares outstanding used in computing pro forma net loss per share—basic and diluted	20,483,543	21,754,727
Pro forma net loss per share—basic and diluted (unaudited)	$ (0.95)	$ (0.26)

Note 16. Subsequent Events

The Company evaluated subsequent events through March 27, 2019, the date on which the consolidated financial statements were available for issuance.

For the three months ended March 31, 2019, subsequent events were evaluated through May 23, 2019, the date on which the unaudited interim consolidated financial statements were available for issuance.

Reverse Stock Split

On June 4, 2019, the Company filed an amendment to the Company's amended and restated certificate of incorporation to effect a reverse split of shares of the Company's common stock and redeemable convertible preferred stock on a four-for-one basis (the "Reverse Stock Split"). The par value of the common stock and redeemable convertible preferred stock was not adjusted as a result of the Reverse Stock Split. All references to common stock, options to purchase common stock, share data, per share data, redeemable convertible preferred stock and related information contained in these consolidated financial statements have been retrospectively adjusted to reflect the effect of the Reverse Stock Split for all periods presented.

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PART II

INFORMATION NOT REQUIRED IN PROSPECTUS

Item 13. Other Expenses of Issuance and Distribution.

The following table indicates the expenses to be incurred in connection with the offering described in this registration statement, other than underwriting discounts and commissions, all of which will be paid by us. All amounts are estimated except the SEC registration fee, the Financial Industry Regulatory Authority, Inc. ("FINRA") filing fee, and the exchange listing fee.

	Amount
SEC registration fee	$ 14,868
FINRA filing fee	18,900
Exchange listing fee	150,000
Accountants' fees and expenses	840,000
Legal fees and expenses	1,500,000
Transfer Agent's fees and expenses	15,000
Printing and engraving expenses	500,000
Miscellaneous	161,232
Total expenses	$3,200,000

Item 14. Indemnification of Directors and Officers.

Section 145 of the Delaware General Corporation Law authorizes a court to award, or a corporation's board of directors to grant, indemnity to directors and officers in terms sufficiently broad to permit such indemnification under certain circumstances for liabilities, including reimbursement for expenses incurred, arising under the Securities Act. Our amended and restated certificate of incorporation that will be in effect on the closing of this offering permits indemnification of our directors, officers, employees, and other agents to the maximum extent permitted by the Delaware General Corporation Law, and our amended and restated bylaws that will be in effect on the closing of this offering provide that we will indemnify our directors and officers and permit us to indemnify our employees and other agents, in each case to the maximum extent permitted by the Delaware General Corporation Law.

We have entered into indemnification agreements with our directors and officers, whereby we have agreed to indemnify our directors and officers to the fullest extent permitted by law, including indemnification against expenses and liabilities incurred in legal proceedings to which the director or officer was, or is threatened to be made, a party by reason of the fact that such director or officer is or was a director, officer, employee, or agent of Personalis, Inc., provided that such director or officer acted in good faith and in a manner that the director or officer reasonably believed to be in, or not opposed to, the best interest of Personalis, Inc. At present, there is no pending litigation or proceeding involving a director or officer of Personalis, Inc. regarding which indemnification is sought, nor is the registrant aware of any threatened litigation that may result in claims for indemnification.

We maintain insurance policies that indemnify our directors and officers against various liabilities arising under the Securities Act and the Exchange Act that might be incurred by any director or officer in his or her capacity as such.

Item 15. Recent Sales of Unregistered Securities.

Since January 1, 2016, we have issued the following unregistered securities:

(1) In June 2017, we issued $12,225,000 million in principal amount of convertible promissory notes to a total of 37 accredited investors (including certain holders of 5% or more of our capital stock and entities affiliated with certain of our directors), which notes were subsequently amended and converted into an aggregate of 1,667,997 shares of our Series C redeemable convertible preferred stock in September 2018 at a price of $8.052 per share.

(2) In June 2017, we issued a warrant exercisable for up to 62,096 shares of our Series C redeemable convertible preferred stock at a price of $8.052 per share.

(3) In March 2019, we issued a warrant exercisable for up to 65,502 shares of our common stock at a price of $9.16 per share.

(4) From January 1, 2016 through June 7, 2019, we granted to certain employees, consultants and directors options to purchase an aggregate of 3,178,143 shares of our common stock under our 2011 Plan at exercise prices ranging from $2.44 to $13.20 per share.

(5) From January 1, 2016 through June 7, 2019, we issued an aggregate of 782,874 shares of our common stock upon the exercise of options granted under our 2011 Plan, at exercise prices ranging from $0.44 to $5.28 per share, for an aggregate exercise price of $717,763.35.

None of the foregoing transactions involved any underwriters, underwriting discounts, or commissions, or any public offering. Unless otherwise stated, the sales of the above securities were deemed to be exempt from registration under the Securities Act in reliance on Section 4(a)(2) of the Securities Act (and Regulation D or Regulation S promulgated thereunder) or Rule 701 promulgated under Section 3(b) of the Securities Act as transactions by an issuer not involving any public offering or pursuant to benefit plans and contracts relating to compensation as provided under Rule 701. The recipients of the securities in each of these transactions represented their intentions to acquire the securities for investment only and not with a view to or for sale in connection with any distribution thereof, and appropriate legends were placed on the share certificates issued in these transactions. All recipients had adequate access, through their relationships with us, to information about us. The sales of these securities were made without any general solicitation or advertising.

Item 16. Exhibits and Financial Statement Schedules.

(a) Exhibits.

Exhibit Number	Description of Exhibit
1.1	Form of Underwriting Agreement.
3.1	Amended and Restated Certificate of Incorporation of the Registrant, as amended, as currently in effect.
3.2†	Bylaws of the Registrant, as currently in effect.
3.3	Form of Amended and Restated Certificate of Incorporation of the Registrant, to be in effect prior to the closing of this offering.
3.4	Form of Amended and Restated Bylaws of the Registrant, to be in effect prior to the closing of this offering.
4.1	Form of common stock certificate of the Registrant.
4.2†	Amended and Restated Investor Rights Agreement by and among the Registrant and certain of its stockholders, dated December 16, 2014.

Exhibit Number	Description of Exhibit
4.3†	Warrant to purchase capital stock of the Registrant, issued to Silicon Valley Bank, dated September 25, 2014.
4.4†	Warrant to purchase capital stock of the Registrant, issued to TriplePoint Capital LLC, dated June 28, 2017.
4.5†	Warrant to purchase capital stock of the Registrant, issued to TriplePoint Capital LLC, dated March 22, 2019.
5.1	Opinion of Cooley LLP.
10.1†	Personalis, Inc. 2011 Equity Incentive Plan, as amended, and forms of agreements thereunder.
10.2	Personalis, Inc. 2019 Equity Incentive Plan and forms of agreements thereunder.
10.3	Personalis, Inc. 2019 Employee Stock Purchase Plan.
10.4	Form of Indemnification Agreement entered into by and between the Registrant and each director and executive officer.
10.5	Employment Terms Letter, by and between John West and the Registrant, dated June 2, 2019.
10.6	Employment Terms Letter, by and between Clinton Musil and the Registrant, dated June 2, 2019.
10.7	Employment Terms Letter, by and between Dr. Richard Chen and the Registrant, dated June 2, 2019.
10.8	Employment Terms Letter, by and between Aaron Tachibana and the Registrant, dated June 2, 2019.
10.9†	Lease, by and between MENLO PREHC I, LLC, MENLO PREPI I, LLC, TPI Investors 9, LLC and the Registrant, dated February 2, 2015.
10.10#†	Contract No. VA240-17-D-0103, by and between the U.S. Department of Veterans Affairs and the Registrant, dated September 28, 2017.
10.11#†	Quotation for Supply of Genetic Analysis Products No. 4079884, by and between Illumina, Inc. and the Registrant, dated March 21, 2017.
10.12#†	Purchase Order No. P11405, by and between Illumina, Inc. and the Registrant, dated March 31, 2017.
10.13#†	Master Services Subcontract Agreement, by and between Illumina, Inc. and the Registrant, dated November 1, 2017.
10.14#†	Pricing Agreement, by and between Illumina, Inc. and the Registrant, dated November 22, 2017.
10.15#†	Fasttrack Genetic Analysis Services Agreement No. MQ-20171213CG100, by and between Illumina, Inc. and the Registrant, dated December 13, 2017.
10.16#†	Quotation for Supply of Genetic Analysis Products No. SQ-20190214CG102, by and between Illumina, Inc. and the Registrant, dated February 22, 2019.
10.17#†	Quotation for Supply of Genetic Analysis Products No. 4192031, by and between Illumina, Inc. and the Registrant, dated March 1, 2019.
10.18#†	Purchase Order No. P11405, by and between Illumina, Inc. and the Registrant, dated March 20, 2019.
10.19#†	Pricing Agreement, by and between Illumina, Inc. and the Registrant, dated March 26, 2019.
10.20†	Plain English Revolving Loan and Security Agreement, by and between TriplePoint Capital LLC and the Registrant, dated June 28, 2017.

Exhibit Number	Description of Exhibit
10.21†	First Amendment to Plain English Revolving Loan and Security Agreement, by and between TriplePoint Capital LLC and the Registrant, dated March 22, 2019.
10.22†	Form of convertible promissory note of the Registrant.
10.23†	Amendment No. 1 to the convertible promissory note of the Registrant.
10.24†	Amendment No. 2 to the convertible promissory note of the Registrant.
16.1†	Letter from Moss Adams LLP to the Securities and Exchange Commission, dated March 27, 2019.
21.1†	List of subsidiaries of the Registrant.
23.1	Consent of Deloitte & Touche LLP, independent registered public accounting firm.
23.2	Consent of Cooley LLP (included in Exhibit 5.1).
24.1†	Power of Attorney (included on signature page).

† Previously filed

Portions of this exhibit (indicated by asterisks) have been omitted as the Registrant has determined that (i) the omitted information is not material and (ii) the omitted information would likely cause competitive harm to the Registrant if publicly disclosed.

(b) Financial Statement Schedules.

All financial statement schedules are omitted because the information required to be set forth therein is not applicable or is shown in the consolidated financial statements or the notes thereto.

Item 17. Undertakings.

The undersigned Registrant hereby undertakes to provide to the underwriters at the closing specified in the underwriting agreement, certificates in such denominations and registered in such names as required by the underwriters to permit prompt delivery to each purchaser.

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.

The undersigned Registrant hereby undertakes that:

(1) For purposes of determining any liability under the Securities Act of 1933, 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 of 1933, 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.

(3) For the purpose of determining liability of the registrant under the Securities Act of 1933 to any purchaser in the initial distribution of the securities: The undersigned registrant undertakes that in a primary offering of securities of the undersigned registrant pursuant to this registration statement, regardless of the underwriting method used to sell the securities to the purchaser, if the securities are offered or sold to such purchaser by means of any of the following communications, the undersigned registrant will be a seller to the purchaser and will be considered to offer or sell such securities to such purchaser:

(i) Any preliminary prospectus or prospectus of the undersigned registrant relating to the offering required to be filed pursuant to Rule 424;

(ii) Any free writing prospectus relating to the offering prepared by or on behalf of the undersigned registrant or used or referred to by the undersigned registrant;

(iii) The portion of any other free writing prospectus relating to the offering containing material information about the undersigned registrant or its securities provided by or on behalf of the undersigned registrant; and

(iv) Any other communication that is an offer in the offering made by the undersigned registrant to the purchaser.

(4) If the registrant is subject to Rule 430C, each prospectus filed pursuant to Rule 424(b) as part of a registration statement relating to an offering, other than registration statements relying on Rule 430B or other than prospectuses filed in reliance on Rule 430A, shall be deemed to be part of and included in the registration statement as of the date it is first used after effectiveness. Provided, however, that no statement made in a registration statement or prospectus that is part of the registration statement or made in a document incorporated or deemed incorporated by reference into the registration statement or prospectus that is part of the registration statement will, as to a purchaser with a time of contract of sale prior to such first use, supersede or modify any statement that was made in the registration statement or prospectus that was part of the registration statement or made in any such document immediately prior to such date of first use.

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, thereunto duly authorized, in the City of Menlo Park, State of California, on June 7, 2019.

PERSONALIS, INC.

By: /s/ John West
John West
President and Chief Executive Officer

Pursuant to the requirements of the Securities Act of 1933, this registration statement has been signed by the following persons in the capacities and on the dates indicated.

Signature	Title	Date
/s/ John West John West	President, Chief Executive Officer and Director *(Principal Executive Officer)*	June 7, 2019
/s/ Aaron Tachibana Aaron Tachibana	Chief Financial Officer *(Principal Financial and Accounting Officer)*	June 7, 2019
/s/ * Patrick Balthrop	Director	June 7, 2019
/s/ * A. Blaine Bowman	Director	June 7, 2019
/s/ * Alan Colowick, M.D.	Director	June 7, 2019
/s/ * Kenneth Ludlum	Director	June 7, 2019
/s/ * Jonathan MacQuitty, Ph.D.	Director	June 7, 2019
/s/ * Paul Ricci	Director	June 7, 2019

*By: /s/ John West
John West
Attorney-in-fact

Exhibit 1.1

[•] Shares

PERSONALIS, INC.

COMMON STOCK, $0.0001 PAR VALUE PER SHARE

UNDERWRITING AGREEMENT

[•], 2019

_____, 2019

Morgan Stanley & Co. LLC
BofA Securities, Inc.
Cowen and Company, LLC
c/o Morgan Stanley & Co. LLC
1585 Broadway
New York, New York 10036

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

c/o Cowen and Company, LLC
599 Lexington Avenue, 20th Floor
New York, New York 10022

Ladies and Gentlemen:

Personalis, Inc., a Delaware corporation (the "**Company**"), proposes to issue and sell to the several Underwriters named in Schedule I hereto (the "**Underwriters**"), for whom Morgan Stanley & Co. LLC, BofA Securities, Inc. and Cowen and Company, LLC are acting as representatives (the "**Representatives**"), [•] shares of its common stock, $0.0001 par value per share (the "**Firm Shares**"). The Company also proposes to issue and sell to the several Underwriters not more than an additional [•] shares of its common stock, $0.0001 par value per share (the "**Additional Shares**"), if and to the extent that the Representatives shall have determined to exercise, on behalf of the Underwriters, the right to purchase such shares of common stock granted to the Underwriters in Section 2 hereof. The Firm Shares and the Additional Shares are hereinafter collectively referred to as the "**Shares.**" The shares of common stock, $0.0001 par value per share, of the Company to be outstanding after giving effect to the sales contemplated hereby are hereinafter referred to as the "**Common Stock.**"

The Company has filed with the Securities and Exchange Commission (the "**Commission**") a registration statement, including a prospectus, relating to the Shares. The registration statement as amended at the time it becomes effective, including the information (if any) deemed to be part of the registration statement at the time of effectiveness pursuant to Rule 430A under the Securities Act of 1933, as amended (the "**Securities Act**"), is hereinafter referred to as the "**Registration Statement**"; the prospectus in the form first used to confirm sales of Shares (or in the form first made available to the Underwriters by the Company to meet requests of purchasers pursuant to Rule 173 under the Securities Act) is hereinafter referred to as the "**Prospectus.**" If the Company has filed an abbreviated registration statement to register additional shares of Common Stock pursuant to Rule 462(b) under the Securities Act (the "**Rule 462 Registration Statement**"), then any reference herein to the term "**Registration Statement**" shall be deemed to include such Rule 462 Registration Statement.

For purposes of this agreement (the "**Agreement**"), "**free writing prospectus**" has the meaning set forth in Rule 405 under the Securities Act, "**Time of Sale Prospectus**" means the preliminary prospectus contained in the Registration Statement at the time of its effectiveness together with the documents and pricing information and free writing prospectuses, if any, set forth in Schedule II hereto, and "**broadly available road show**" means a "bona fide electronic road show" as defined in Rule 433(h)(5) under the Securities Act that has been made available without restriction to any person. As used herein, the terms "Registration Statement," "preliminary prospectus," "Time of Sale Prospectus" and "Prospectus" shall include the documents, if any, incorporated by reference therein as of the date hereof.

Morgan Stanley & Co. LLC ("**Morgan Stanley**") has agreed to reserve a portion of the Shares to be purchased by it under this Agreement for sale to the Company's non-employee directors (collectively, "**Participants**"), as set forth in the Prospectus under the heading "Underwriters" (the "**Directed Share Program**"). The Shares to be sold by Morgan Stanley 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 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. *Representations and Warranties*. The Company represents and warrants to and agrees with each of the Underwriters that:

(a) The Registration Statement has become effective; no stop order suspending the effectiveness of the Registration Statement is in effect, and no proceedings for such purpose are pending before or, to the Company's knowledge, threatened by the Commission.

(b) (i) The Registration Statement, when it became effective, did not contain and, as amended or supplemented, if applicable, will not contain, as of the date of such amendment or supplement, any 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, (ii) the Registration Statement and the Prospectus comply and, as amended or supplemented, if applicable, will, as of the date of such amendment or supplement, comply in all material respects with the Securities Act and the applicable rules and regulations of the Commission thereunder, (iii) the Time of Sale Prospectus does not, and at the time of each sale of the Shares in connection with the offering when the Prospectus is not yet available to prospective purchasers and at the Closing Date (as defined in Section 4), the Time of Sale Prospectus, as then amended or supplemented by the Company, if applicable, will not, contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading, (iv) each

broadly available road show, if any, when considered together with the Time of Sale Prospectus, does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading and (v) the Prospectus, as of its date, does not contain and, as amended or supplemented, if applicable, as of the date of such amendment or supplement and as of the Closing Date, will not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading, except that the representations and warranties set forth in this paragraph do not apply to statements or omissions in the Registration Statement, the Time of Sale Prospectus or the Prospectus based upon information relating to any Underwriter furnished to the Company in writing by or on behalf of any such Underwriter through the Representatives expressly for use therein.

(c) The Company is not an "ineligible issuer" in connection with the offering pursuant to Rules 164, 405 and 433 under the Securities Act. Any free writing prospectus that the Company is required to file pursuant to Rule 433(d) under the Securities Act has been, or will be, filed with the Commission in accordance with the requirements of the Securities Act and the applicable rules and regulations of the Commission thereunder. Each free writing prospectus that the Company has filed, or is required to file, pursuant to Rule 433(d) under the Securities Act or that was prepared by or on behalf of or used or referred to by the Company complies or, if filed after the effective time of this Agreement, will comply as of the date of such filing in all material respects with the requirements of the Securities Act and the applicable rules and regulations of the Commission thereunder. Except for the free writing prospectuses, if any, identified in Schedule II hereto, and electronic road shows, if any, each furnished to the Representatives before first use, the Company has not prepared, used or referred to, and will not, without the Representatives' prior consent, prepare, use or refer to, any free writing prospectus.

(d) The Company has been duly incorporated, is validly existing as a corporation in good standing under the laws of the State of Delaware, has the corporate power and authority to own or lease its property and to conduct its business as described in the Time of Sale Prospectus and is duly qualified to transact business and is in good standing in each jurisdiction in which the conduct of its business or its ownership or leasing of property requires such qualification, except to the extent that the failure to be so qualified or be in good standing would not, individually or in the aggregate, have a material adverse effect on the Company and its subsidiaries, taken as a whole.

(e) Each subsidiary of the Company has been duly organized, is validly existing and in good standing under the laws of the jurisdiction of its organization (to the extent the concept of good standing is applicable in such jurisdiction), has the corporate or other organizational power and authority to own or lease its property and to conduct its business as described in the Time of Sale

Prospectus and is duly qualified to transact business and is in good standing in each jurisdiction (to the extent the concept of good standing is applicable in such jurisdiction) in which the conduct of its business or its ownership or leasing of property requires such qualification, except to the extent that the failure to be so qualified or be in good standing would not have a material adverse effect on the Company and its subsidiaries, taken as a whole; all of the issued shares of capital stock of each subsidiary of the Company have been duly and validly authorized and issued, are fully paid and non-assessable (to the extent such concepts are applicable in such jurisdiction) and are owned directly by the Company or a subsidiary of the Company, free and clear of all liens, encumbrances, equities or claims.

(f) This Agreement has been duly authorized, executed and delivered by the Company.

(g) The authorized capital stock of the Company conforms as to legal matters to the description thereof contained in each of the Time of Sale Prospectus and the Prospectus.

(h) The shares of Common Stock outstanding prior to the issuance of the Shares have been duly authorized and are validly issued, fully paid and non-assessable.

(i) The Shares have been duly authorized and, when issued, delivered and paid for in accordance with the terms of this Agreement, will be validly issued, fully paid and non-assessable, and the issuance of such Shares will not be subject to any preemptive or similar rights.

(j) The execution and delivery by the Company of, and the performance by the Company of its obligations under, this Agreement will not contravene any provision of (i) applicable law, (ii) the certificate of incorporation or bylaws of the Company, (iii) any agreement or other instrument binding upon the Company or any of its subsidiaries that is material to the Company and its subsidiaries, taken as a whole, or (iv) any judgment, order or decree of any governmental body, agency or court having jurisdiction over the Company or any subsidiary, except that in the case of clauses (i), (iii) and (iv) as would not, individually or in the aggregate, have a material adverse effect on the Company and its subsidiaries taken as a whole or on the power and ability of the Company to perform its obligations under this Agreement; and no consent, approval, authorization or order of, or qualification with, any governmental body or agency is required for the performance by the Company of its obligations under this Agreement, except such as may be required by the securities or Blue Sky laws of the various states or foreign jurisdictions or the rules and regulations of the Financial Industry Regulatory Authority ("**FINRA**") in connection with the offer and sale of the Shares.

(k) There has not occurred any material adverse change, or any development involving a prospective material adverse change, in the condition, financial or otherwise, or in the earnings, business or operations of the Company and its subsidiaries, taken as a whole, from that set forth in the Time of Sale Prospectus.

(l) There are no legal or governmental proceedings pending or, to the knowledge of the Company, threatened to which the Company or any of its subsidiaries is a party or to which any of the properties of the Company or any of its subsidiaries is subject (i) other than proceedings accurately described in all material respects in the Time of Sale Prospectus and proceedings that would not have a material adverse effect on the Company and its subsidiaries, taken as a whole, or on the power or ability of the Company to perform its obligations under this Agreement or to consummate the transactions contemplated by the Time of Sale Prospectus or (ii) that are required to be described in the Registration Statement or the Prospectus and are not so described in all material respects; and there are no statutes, regulations, contracts or other documents to which the Company or any of its subsidiaries is subject or by which the Company or any of its subsidiaries is bound that are required to be described in the Registration Statement or the Prospectus or to be filed as exhibits to the Registration Statement that are not described in all material respects or filed as required.

(m) Each preliminary prospectus filed as part of the Registration Statement as originally filed or as part of any amendment thereto, or filed pursuant to Rule 424 under the Securities Act, complied when so filed in all material respects with the Securities Act and the applicable rules and regulations of the Commission thereunder.

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

(o) The Company and its subsidiaries (i) are in compliance with any and all applicable foreign, federal, state and local laws and regulations relating to the protection of human health and safety, the environment or hazardous or toxic substances or wastes, pollutants or contaminants ("**Environmental Laws**"), (ii) have received all permits, licenses or other approvals required of them under applicable Environmental Laws to conduct their respective businesses and (iii) are in compliance with all terms and conditions of any such permit, license or approval, except where such noncompliance with Environmental Laws, failure to receive required permits, licenses or other approvals or failure to comply with the terms and conditions of such permits, licenses or approvals would not, singly or in the aggregate, reasonably be expected to have a material adverse effect on the Company and its subsidiaries, taken as a whole.

(p) There are no costs or liabilities associated with Environmental Laws (including, without limitation, any capital or operating expenditures required for clean-up, closure of properties or compliance with Environmental Laws or any permit, license or approval, any related constraints on operating activities and any potential liabilities to third parties) which would, singly or in the aggregate, reasonably be expected to have a material adverse effect on the Company and its subsidiaries, taken as a whole.

(q) Except as has been validly waived or complied with in connection with the issuance and sale of the Shares contemplated hereby and as described in each of the Registration Statement, the Time of Sale Prospectus and the Prospectus, there are no contracts, agreements or understandings between the Company and any person granting such person the right to require the Company to file a registration statement under the Securities Act with respect to any securities of the Company or to require the Company to include such securities with the Shares registered pursuant to the Registration Statement.

(r) (i) Neither the Company nor any of its subsidiaries or controlled affiliates, nor any director, officer or employee thereof, nor, to the Company's knowledge, any agent or representative of the Company or of any of its subsidiaries or controlled affiliates, has taken any action in furtherance of an offer, payment, promise to pay, or authorization or approval of the payment, giving or receipt of money, property, gifts or anything else of value, directly or indirectly, to any government official (including any officer or employee of a government or government-owned or controlled entity or of a public international organization, or any person acting in an official capacity for or on behalf of any of the foregoing, or any political party or party official or candidate for political office) to improperly influence official action, or to any person in violation of any applicable anti-corruption laws; (ii) the Company and its subsidiaries and controlled affiliates have conducted their businesses in compliance with applicable anti-corruption laws and have instituted and maintained and will continue to maintain policies and procedures reasonably designed to promote and achieve compliance with such laws and with the representations and warranties contained herein; and (iii) neither the Company nor its subsidiaries will use, directly or indirectly, the proceeds of the offering in furtherance of an offer, payment, promise to pay, or authorization of the payment or giving of money, or anything else of value, to any person in violation of any applicable anti-corruption laws.

(s) The operations of the Company and its subsidiaries are and have been conducted at all times in material compliance with all applicable financial recordkeeping and reporting requirements, including those of the Bank Secrecy Act, as amended by Title III of the Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act of 2001 (USA PATRIOT Act), and the applicable anti-money laundering statutes of jurisdictions where the Company and its subsidiaries conduct business, the rules and regulations thereunder and any related or similar rules, regulations or

guidelines, issued, administered or enforced by any governmental agency having jurisdiction over the Company or any of its subsidiaries (collectively, the "**Anti-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 or any of its subsidiaries with respect to the Anti-Money Laundering Laws is pending or, to the best knowledge of the Company, threatened.

(t) (i) Neither the Company nor any of its subsidiaries, nor any director, officer or employee thereof, nor, to the Company's knowledge, any agent, affiliate or representative of the Company or any of its subsidiaries, is an individual or entity ("**Person**") that is, or is owned or controlled by one or more Persons that are:

(A) the subject of any sanctions administered or enforced by the U.S. Department of Treasury's Office of Foreign Assets Control, the United Nations Security Council, the European Union, Her Majesty's Treasury, or other relevant sanctions authority (collectively, "**Sanctions**"), or

(B) located, organized or resident in a country or territory that is the subject of Sanctions (including, without limitation, Crimea, Cuba, Iran, North Korea and Syria);

(ii) The Company will not, directly or indirectly, use the proceeds of the offering, or lend, contribute or otherwise make available such proceeds to any subsidiary, joint venture partner or other Person:

(A) to fund or facilitate any activities or business of or with any Person or in any country or territory that, at the time of such funding or facilitation, is the subject of Sanctions; or

(B) in any other manner that will result in a violation of Sanctions by any Person (including any Person participating in the offering, whether as underwriter, advisor, investor or otherwise); and

(iii) For the past five years, the Company and its subsidiaries have not knowingly engaged in, are not now knowingly engaged in, and will not knowingly engage in, any dealings or transactions with any Person, or in any country or territory, that at the time of the dealing or transaction is or was the subject of Sanctions.

(u) Subsequent to the respective dates as of which information is given in each of the Registration Statement, the Time of Sale Prospectus and the Prospectus, (i) the Company and its subsidiaries have not incurred any material liability or obligation, direct or contingent, nor entered into any material transaction; (ii) the Company has not purchased any of its outstanding capital stock, other than from its employees or other service providers in connection with

the termination of their service pursuant to equity compensation plans or agreements described in the Time of Sale Prospectus or in connection with the exercise of the Company's right of first refusal upon a proposed transfer, nor declared, paid or otherwise made any dividend or distribution of any kind on its capital stock other than ordinary and customary dividends; and (iii) there has not been any material change in the capital stock (other than the exercise of equity awards or grants of equity awards or forfeiture of equity awards outstanding as of such respective dates as of which information is given in each of the Registration Statement, the Time of Sale Prospectus and the Prospectus, in each case granted pursuant to the equity compensation plans described in the Time of Sale Prospectus), short-term debt or long-term debt of the Company and its subsidiaries taken as a whole, except in each case as described in each of the Registration Statement, the Time of Sale Prospectus and the Prospectus, respectively.

(v) The Company and its subsidiaries do not own any real property. The Company and its subsidiaries have good and marketable title to all personal property owned by them that is material to the business of the Company and its subsidiaries, taken as a whole, in each case free and clear of all liens, encumbrances and defects except such as are described in the Time of Sale 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 its subsidiaries, in any material respect; and any real property and buildings held under lease by the Company and its subsidiaries are held by them under valid, subsisting and, to the Company's knowledge, 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 and its subsidiaries, in each case except as described in the Time of Sale Prospectus.

(w) Except as described in the Registration Statement, the Time of Sale Prospectus or the Prospectus, the Company and its subsidiaries own, possess or license, or can acquire on commercially reasonable terms, sufficient rights to use all material patents, patent rights, licenses, inventions, copyrights, know-how (including trade secrets and other unpatented and/or unpatentable proprietary or confidential information, systems or procedures), trademarks, service marks, trade names, domain names and other intellectual property including all registrations and applications for registrations of any of the foregoing and all goodwill associated with any of the foregoing (collectively, the "**Intellectual Property**") currently employed by them in connection with the business as currently operated by them, or as proposed to be operated by them in the Registration Statement, the Time of Sale Prospectus or the Prospectus, except where the failure to own, possess, have the right to use or the ability to acquire any of the foregoing would not result in a material adverse effect on the Company and its subsidiaries, taken as a whole. Except as disclosed in the Registration Statement, Time of Sale Prospectus and the Prospectus, neither the Company nor any of its subsidiaries has received any notice of infringement, misappropriation, or violation of or

conflict with the asserted rights of others with respect to any of the foregoing which, singly or in the aggregate, if the subject of an unfavorable decision, ruling or finding, would have a material adverse effect on the Company and its subsidiaries, taken as a whole. To the knowledge of the Company, (i) neither the Company nor any of its subsidiaries has infringed, misappropriated or otherwise violated any Intellectual Property of any third party and (ii) the Intellectual Property of the Company or any of its subsidiaries has not been infringed, misappropriated or otherwise violated by any person. Except as described in the Registration Statement, the Time of Sale Prospectus or the Prospectus, neither the Company nor any of its subsidiaries has received any notice challenging the ownership, validity, enforceability or scope of any Intellectual Property owned by or exclusively licensed to the Company or any of its subsidiaries. To the knowledge of the Company, all material Intellectual Property owned by or exclusively licensed to the Company and its subsidiaries is valid and enforceable. The Company and its subsidiaries have taken reasonable steps in accordance with customary industry practice to maintain the confidentiality of all Intellectual Property, the value of which to the Company or any of its subsidiaries is contingent upon maintaining the confidentiality thereof.

(x) Except as would not, individually or in the aggregate, have a material adverse effect on the Company and its subsidiaries, taken as a whole, (i) the Company and its subsidiaries use and have used any and all software and other materials distributed under a "free," "open source," or similar licensing model (including but not limited to the MIT License, Apache License, GNU General Public License, GNU Lesser General Public License and GNU Affero General Public License) ("**Open Source Software**") in compliance with all license terms applicable to such Open Source Software; and (ii) neither the Company nor any of its subsidiaries uses or distributes or has used or distributed any Open Source Software in any manner that requires or has required (A) the Company or any of its subsidiaries to permit reverse engineering of any software code or other technology owned by the Company or any of its subsidiaries or (B) any software code or other technology owned by the Company or any of its subsidiaries to be (1) disclosed or distributed in source code form, (2) licensed for the purpose of making derivative works or (3) redistributed at no charge.

(y) The Company's and its subsidiaries' information technology and computer systems, networks, hardware, software, internet web sites, and data and databases (including the data of their respective customers, employees, suppliers, vendors and any third party data maintained by or on behalf of the Company and its subsidiaries) are adequate for, and operate and perform in all material respects as required in connection with, the operation of the business of the Company and its subsidiaries. The Company and each of its subsidiaries have taken all reasonable technical and organizational measures necessary to protect the information technology systems and Data used in connection with the operation of the Company's and its subsidiaries' businesses. Without limiting the foregoing, the Company and its subsidiaries have used reasonable efforts to establish and maintain, and have established, maintained, implemented and complied with,

reasonable information technology, information security, cyber security and data protection controls, policies and procedures, including oversight, access controls, encryption, technological and physical safeguards and business continuity/disaster recovery and security plans that are designed to protect against and prevent breach, destruction, loss, unauthorized distribution, use, access, disablement, misappropriation or modification, or other compromise or misuse of or relating to any information technology system or Data used in connection with the operation of the Company's and its subsidiaries' businesses ("**Breach**"). To the knowledge of the Company, there has been no such Breach. The Company and its subsidiaries have not been notified of and have no knowledge of any event or condition that would reasonably be expected to result in, any such Breach.

(z) No material labor dispute with the employees of the Company or any of its subsidiaries exists, except as described in the Time of Sale Prospectus, or, to the knowledge of the Company, is imminent; and the Company is not aware of any existing, threatened or imminent labor disturbance by the employees of any of its principal suppliers, manufacturers or contractors that could reasonably be expected to have a material adverse effect on the Company and its subsidiaries, taken as a whole.

(aa) The Company and each of its subsidiaries are insured by insurers of recognized financial responsibility against such losses and risks and in such amounts as are, in the reasonable judgment of the Company, prudent and customary in the businesses in which they are engaged; neither the Company nor any of its subsidiaries has been refused any insurance coverage sought or applied for; and neither the Company nor any of its subsidiaries has any 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 from similar insurers as may be necessary to continue its business at a cost that would not have a material adverse effect on the Company and its subsidiaries, taken as a whole, except as described in the Time of Sale Prospectus.

(bb) The statistical, industry-related and market-related data included in the Registration Statement, the Time of Sale Prospectus or the Prospectus are based on or derived from sources that the Company reasonably and in good faith believes are reliable and accurate and, to the extent required, the Company has obtained the written consent to the use of such data from such sources.

(cc) The Company has operated at all times and is currently in compliance in all material respects with all applicable statutes, rules, regulations and policies of the U.S. Food and Drug Administration (the "**FDA**") and other applicable U.S. and foreign regulatory authorities, including the European Medicines Agency and the UK Medicines & Healthcare products Regulatory Agency (collectively, the "**Regulatory Authorities**"), including, without limitation:

(i) the Federal Food, Drug, and Cosmetic Act and the regulations promulgated thereunder;

(ii) all applicable federal, state, local and foreign health care laws, including, without limitation, the U.S. Anti-Kickback Statute (42 U.S.C. Section 1320a-7b(b)), the Civil Monetary Penalties Law (42 U.S.C. § 1320a-7a), the U.S. Civil False Claims Act (31 U.S.C. Section 3729 et seq.), all applicable federal, state, local and all foreign criminal laws relating to health care fraud and abuse, including but not limited to the U.S. False Statements Law (42 U.S.C. Section 1320a-7b(a)), 18 U.S.C. Sections 286 and 287, and the health care fraud criminal provisions under the U.S. Health Insurance Portability and Accountability Act of 1996 ("**HIPAA**") (42 U.S.C. Section 1320d et seq.), the exclusion law (42 U.S.C. Section 1320a-7), the statutes, regulations and directives of applicable government funded or sponsored healthcare programs, and the regulations promulgated pursuant to such statutes;

(iii) the Standards for Privacy of Individually Identifiable Health Information, the Security Standards, and the Standards for Electronic Transactions and Code Sets promulgated under HIPAA, the Health Information Technology for Economic and Clinical Health Act (42 U.S.C. Section 17921 et seq.), and the regulations promulgated thereunder and any state or non-U.S. counterpart thereof or any other law or regulation the purpose of which is to protect the privacy of individuals or prescribers;

(iv) the Patient Protection and Affordable Care Act of 2010, as amended by the Health Care and Education Reconciliation Act of 2010, the regulations promulgated thereunder;

(v) the U.S. Controlled Substances Act (21 U.S.C. Section 801 et seq.);

(vi) the Clinical Laboratories Improvement Act of 1967, as amended);

(vii) licensure, quality, safety and accreditation requirements under applicable federal, state, local or foreign laws or regulatory bodies; and

(viii) all other local, state, federal, national, supranational and foreign laws, relating to the regulation of the Company and the ownership, testing, development, manufacture, packaging, processing, use, distribution, marketing, labeling, promotion, sale, offer for sale, storage, import, export or disposal of any product under development, manufactured or distributed by the Company; (clauses (i) through (viii), collectively, "**Health Care Laws**").

(dd) (i) the studies conducted by the Company in support of the validity or utility of the Company's NeXT Platform and other current and potential offerings, were, and if still pending are, being conducted in all material respects in accordance with standard medical and experimental protocols, procedures and controls pursuant to accepted professional scientific research standards and procedures; (ii) the descriptions of the results of such studies contained in the Registration Statement, the Time of Sale Prospectus or the Prospectus are accurate and complete in all material respects; and (iii) the Company has no knowledge of any other studies not described in the Registration Statement, the Time of Sale Prospectus and the Prospectus, the results of which are inconsistent with or call into question the results described or referred to in the Registration Statement, the Time of Sale Prospectus and the Prospectus.

(ee) (i) Except as would not, individually or in the aggregate, reasonably be expected to have a material adverse effect on the Company and its subsidiaries, taken as a whole, the Company has filed, obtained, maintained or submitted all reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments as required by any Health Care Laws, and, all such reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments were timely, complete, accurate and not misleading on the date filed (or were corrected or supplemented by a subsequent submission); (ii) the Company has not received written notice of any claim, action, suit, proceeding, hearing, enforcement, investigation, arbitration or other action from any court or arbitrator or Regulatory Authority, other governmental entity or third party alleging that any Company or product operation or activity is in violation of any Health Care Laws, including, without limitation, any FDA Form 483, notice of adverse finding, warning letter, untitled letter or other correspondence or notice from the FDA or any other Regulatory Authority or governmental entity, nor, to the Company's knowledge, is any such claim, action, suit, proceeding, hearing, enforcement, investigation, arbitration or other action threatened; (iii) the Company is not a party to any corporate integrity agreements, monitoring agreements, consent decrees, settlement orders, or similar agreements with or imposed by any Regulatory Authority or other governmental entity; and (iv) neither the Company nor any of its employees, officers or directors has been excluded, suspended or debarred from participation in any U.S. federal health care program or human clinical research or, to the knowledge of the Company, is subject to an inquiry, investigation, proceeding or other similar action by a Regulatory Authority or other governmental entity that could reasonably be expected to result in debarment, suspension, or exclusion.

(ff) The Company's clinical laboratory tests are conducted in compliance in all material respects with all applicable Health Care Laws, and, to the extent applicable, the respective counterparts thereof promulgated by governmental authorities in countries outside the United States. The Company has not received notice from the FDA, HHS or other governmental authority alleging or asserting material noncompliance with any applicable Health Care Law. To the Company's knowledge, neither the FDA nor any other governmental authority is considering such action.

(gg) The Company and its subsidiaries possess all certificates, authorizations and permits issued by the appropriate federal, state or foreign regulatory authorities necessary to conduct their respective businesses, including, without limitation, from the Regulatory Authorities, and neither the Company nor any of its subsidiaries has received any notice of proceedings relating to the revocation or modification of any such certificate, authorization or permit which, singly or in the aggregate, if the subject of an unfavorable decision, ruling or finding, would have a material adverse effect on the Company and its subsidiaries, taken as a whole, except as described in the Time of Sale Prospectus.

(hh) Except as would not, individually or in the aggregate, reasonably be expected to have a material adverse effect on the Company and its subsidiaries, taken as a whole, (i) each employee benefit plan, within the meaning of Section 3(3) of the Employee Retirement Income Security Act of 1974, as amended ("ERISA"), that is sponsored, maintained, administered or contributed to by the Company has been maintained in compliance with its terms and the requirements of any applicable statutes, orders, rules and regulations, including but not limited to ERISA and the Internal Revenue Code of 1986, as amended (the "Code"), and (ii) neither the Company nor any member of its "Controlled Group" (defined as any trade or business, whether or not incorporated, that would be regarded as a single employer with the Company under Section 414 of the Code) (x) has ever sponsored, maintained, contributed to or has had any obligation to contribute to, any employee benefit plan that is subject to Title IV of ERISA or any "multiemployer plan" as defined in Section 3(37) of ERISA or (y) has incurred, or reasonably expects to incur, any liability under Title IV of ERISA.

(ii) The Company and each of its subsidiaries maintain a system of internal accounting controls sufficient to provide reasonable assurance that (i) transactions are executed in accordance with management's general or specific authorizations; (ii) transactions are recorded as necessary to permit preparation of financial statements in conformity with generally accepted accounting principles in the United States ("**U.S. GAAP**") and to maintain asset accountability; (iii) access to assets is permitted only in accordance with management's general or specific authorization; and (iv) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action is taken with respect to any differences. Except as described in the Time of Sale Prospectus, since the end of the Company's most recent audited fiscal year, there has been (i) no material weakness in the Company's internal control over financial reporting (whether or not remediated) and (ii) no change in the Company's internal control over financial reporting that has materially affected, or is reasonably likely to materially affect, the Company's internal control over financial reporting.

(jj) Except as described in the Time of Sale Prospectus or the Registration Statement, the Company has not sold, issued or distributed any shares of Common Stock during the six-month period preceding the date hereof, including any sales pursuant to Rule 144A under, or Regulation D or S of, the Securities Act, other than shares issued pursuant to employee benefit plans, qualified stock option plans or other employee compensation plans or pursuant to outstanding options, rights or warrants.

(kk) The Company and each of its subsidiaries have filed all federal, state, local and foreign tax returns required to be filed by them through the date of this Agreement or have requested extensions thereof (except where the failure to file would not, individually or in the aggregate, have a material adverse effect on the Company and its subsidiaries taken as a whole) and have paid all taxes required to be paid thereon (except for cases in which the failure to pay would not, individually or in the aggregate, have a material adverse effect on the Company and its subsidiaries taken as a whole, or, except as currently being contested in good faith and for which reserves required by U.S. GAAP have been created in the financial statements of the Company), and no unpaid tax deficiency has been determined adversely to the Company or any of its subsidiaries which has had (nor does the Company nor any of its subsidiaries have any notice or knowledge of any unpaid tax deficiency which would reasonably be expected to be determined adversely to the Company or its subsidiaries and which would reasonably be expected to have) a material adverse effect on the Company and its subsidiaries taken as a whole.

(ll) From the time of initial confidential submission of the Registration Statement to the Commission (or, if earlier, the first date on which the Company engaged directly or through any person authorized to act on its behalf in any Testing-the-Waters Communication) through the date hereof, the Company has been and is an "emerging growth company," as defined in Section 2(a) of the Securities Act (an "**Emerging Growth Company**"). "**Testing-the-Waters Communication**" means any oral or written communication with potential investors undertaken in reliance on Section 5(d) of the Securities Act.

(mm) The Company (i) has not alone engaged in any Testing-the-Waters Communication other than Testing-the-Waters Communications with the consent of the Representatives with entities that are qualified institutional buyers within the meaning of Rule 144A under the Securities Act or institutions that are accredited investors within the meaning of Rule 501 under the Securities Act and (ii) has not authorized anyone other than the Representatives to engage in Testing-the-Waters Communications. The Company reconfirms that the Representatives have been authorized to act on its behalf in undertaking Testing-the-Waters Communications. The Company has not distributed any Written Testing-the-Waters Communications. "**Written Testing-the-Waters Communication**" means any Testing-the-Waters Communication that is a written communication within the meaning of Rule 405 under the Securities Act.

(nn) Neither the Company nor any of its subsidiaries has any securities rated by any "nationally recognized statistical rating organization," as such term is defined in Section 3(a)(62) of the Exchange Act.

(oo) As of the time of each sale of the Shares in connection with the offering when the Prospectus is not yet available to prospective purchasers, none of (A) the Time of Sale Prospectus, (B) any free writing prospectus, when considered together with the Time of Sale Prospectus, and (C) any individual Written Testing-the-Waters Communication, when considered together with the Time of Sale Prospectus, included, includes or will include an untrue statement of a material fact or omitted, omits or will omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading.

(pp) Deloitte & Touche LLP, which has expressed its opinion with respect to the financial statements of the Company filed with the Commission as a part of the Registration Statement and included in each of the Time of Sale Prospectus and the Prospectus, is an independent registered public accounting firm with respect to the Company within the applicable rules and regulations adopted by the Commission and the Public Company Accounting Oversight Board (United States) and as required by the Securities Act.

(qq) The consolidated financial statements (including the related notes thereto) of the Company included in the Registration Statement, the Time of Sale Prospectus and the Prospectus comply in all material respects with the applicable requirements of the Securities Act and present fairly in all material respects the consolidated financial position of the Company and its subsidiaries as of the dates indicated and the results of their operations and cash flows for the periods specified. Such financial statements have been prepared in conformity with U.S. GAAP applied on a consistent basis throughout the periods covered thereby; and any supporting schedules included in the Registration Statement present fairly in all material respects the information required to be stated therein; the other financial information included in the Registration Statement, the Time of Sale Prospectus and the Prospectus has been derived from the accounting records of the Company and its subsidiaries and presents fairly in all material respects the information shown thereby.

(rr) (i) The Company and its subsidiaries have complied, and are presently in compliance, in all material respects, with all internal and external privacy policies, contractual obligations, industry standards, applicable laws, statutes, judgments, orders, rules and regulations of any court or arbitrator or other governmental or regulatory authority and any legal obligations regarding the collection, use, transfer, import, export, storage, protection, disposal and disclosure by the Company and its subsidiaries of personal, personally identifiable, household, sensitive, confidential or regulated data ("**Data Security Obligations**", and such data, "**Data**"); (ii) neither the Company nor any of its subsidiaries has received any notification of or complaint regarding, and are

aware of any other facts that, individually or in the aggregate, would reasonably indicate non-compliance with any Data Security Obligation; and (iii) there is no pending, or to the knowledge of the Company, threatened, action, suit or proceeding by or before any court or governmental agency, authority or body pending or threatened alleging non-compliance with any Data Security Obligation. The Company and its subsidiaries have at all times taken steps reasonably necessary in accordance with industry standard practices (including, without limitation, implementing and monitoring compliance with adequate measures with respect to technical and physical security) to protect such information against loss and against unauthorized access, use, modification, disclosure or other misuse, except in each case to the extent that the failure to do so would not reasonably be expected to have a material adverse effect on the Company and its subsidiaries, taken as a whole. To the knowledge of the Company, except as disclosed in the Registration Statement, the Time of Sale Prospectus or the Prospectus or as would not individually or in the aggregate have a material adverse effect on the Company and its subsidiaries, taken as a whole, there has been no unauthorized access to such information.

(ss) The Registration Statement, the Prospectus, the Time of Sale Prospectus and any preliminary prospectus comply, and any amendments or supplements thereto will comply, with any applicable laws or regulations of foreign jurisdictions in which the Prospectus, the Time of Sale Prospectus or any preliminary prospectus, as amended or supplemented, if applicable, are distributed in connection with the Directed Share Program.

(tt) No consent, approval, authorization or order of, or qualification with, any governmental body or agency, other than those obtained, is required in connection with the offering of the Directed Shares in any jurisdiction where the Directed Shares are being offered.

(uu) The Company has not offered, or caused Morgan Stanley or any Morgan Stanley Entity as defined in Section 9 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's 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. *Agreements to Sell and Purchase.* The Company hereby agrees to sell to the several Underwriters, and each Underwriter, upon the basis of the representations and warranties herein contained, but subject to the conditions hereinafter stated, agrees, severally and not jointly, to purchase from the Company the respective numbers of Firm Shares set forth in Schedule I hereto opposite its name at $[•] a share (the "**Purchase Price**").

On the basis of the representations and warranties contained in this Agreement, and subject to its terms and conditions, the Company agrees to sell to the Underwriters

the Additional Shares, and the Underwriters shall have the right to purchase, severally and not jointly, up to [•] Additional Shares at the Purchase Price, provided, however, that the amount paid by the Underwriters for any Additional Shares shall be reduced by an amount per share equal to any dividends declared by the Company and payable on the Firm Shares but not payable on such Additional Shares. The Representatives may exercise this right on behalf of the Underwriters in whole or from time to time in part by giving written notice not later than 30 days after the date of this Agreement. Any exercise notice shall specify the number of Additional Shares to be purchased by the Underwriters and the date on which such shares are to be purchased. Each purchase date must be at least one business day after the written notice is given and may not be earlier than the closing date for the Firm Shares nor later than ten business days after the date of such notice. Additional Shares may be purchased as provided in Section 4 hereof solely for the purpose of covering over-allotments made in connection with the offering of the Firm Shares. On each day, if any, that Additional Shares are to be purchased (an "**Option Closing Date**"), each Underwriter agrees, severally and not jointly, to purchase the number of Additional Shares (subject to such adjustments to eliminate fractional shares as the Representatives may determine) that bears the same proportion to the total number of Additional Shares to be purchased on such Option Closing Date as the number of Firm Shares set forth in Schedule I hereto opposite the name of such Underwriter bears to the total number of Firm Shares.

3. *Terms of Public Offering*. The Company is advised by the Representatives that the Underwriters propose to make a public offering of their respective portions of the Shares as soon after the Registration Statement and this Agreement have become effective as in the Representatives' judgment is advisable. The Company is further advised by the Representatives that the Shares are to be offered to the public initially at $[•] a share (the "**Public Offering Price**") and to certain dealers selected by the Representatives at a price that represents a concession not in excess of $[•] a share under the Public Offering Price.

4. *Payment and Delivery.* Payment for the Firm Shares shall be made to the Company in Federal or other funds immediately available in New York City against delivery of such Firm Shares for the respective accounts of the several Underwriters at 10:00 a.m., New York City time, on [•], 2019, or at such other time on the same or such other date, not later than [•], 2019, as shall be designated in writing by the Representatives. The time and date of such payment are hereinafter referred to as the "**Closing Date**."

Payment for any Additional Shares shall be made to the Company in Federal or other funds immediately available in New York City against delivery of such Additional Shares for the respective accounts of the several Underwriters at 10:00 a.m., New York City time, on the date specified in the corresponding notice described in Section 2 or at such other time on the same or on such other date, in any event not later than [•], 2019, as shall be designated in writing by the Representatives.

The Firm Shares and Additional Shares shall be registered in such names and in such denominations as the Representatives shall request in writing not later than one full

business day prior to the Closing Date or the applicable Option Closing Date, as the case may be. The Firm Shares and Additional Shares shall be delivered to the Representatives on the Closing Date or an Option Closing Date, as the case may be, for the respective accounts of the several Underwriters. The Purchase Price payable by the Underwriters shall be reduced by (i) any transfer taxes paid by, or on behalf of, the Underwriters in connection with the transfer of the Shares to the Underwriters duly paid and (ii) any withholding required by law.

5. *Conditions to the Underwriters' Obligations*. The obligations of the Company to sell the Shares to the Underwriters and the several obligations of the Underwriters to purchase and pay for the Shares on the Closing Date are subject to the condition that the Registration Statement shall have become effective not later than 2:00 p.m. (New York City time) on the date hereof.

The several obligations of the Underwriters are subject to the following further conditions:

(a) Subsequent to the execution and delivery of this Agreement and prior to the Closing Date there shall not have occurred any change, or any development involving a prospective change, in the condition, financial or otherwise, or in the earnings, business or operations of the Company and its subsidiaries, taken as a whole, from that set forth in the Time of Sale Prospectus that, in the Representatives' judgment, is material and adverse and that makes it, in the Representatives' judgment, impracticable to market the Shares on the terms and in the manner contemplated in the Time of Sale Prospectus.

(b) The Underwriters shall have received on the Closing Date a certificate, dated the Closing Date and signed on behalf of the Company by an executive officer of the Company, to the effect set forth in Section 5(a) above and to the effect that the representations and warranties of the Company contained in this Agreement are true and correct as of the Closing Date and that the Company has complied with all of the agreements and satisfied all of the conditions on its part to be performed or satisfied hereunder on or before the Closing Date.

The officer signing and delivering such certificate may rely upon the best of his or her knowledge as to proceedings threatened.

(c) The Underwriters shall have received on the Closing Date an opinion and a negative assurance letter of Cooley LLP ("**Cooley**"), outside counsel for the Company, dated the Closing Date, in form and substance reasonably satisfactory to the Representatives.

(d) The Underwriters shall have received on the Closing Date an opinion of Wilson Sonsini Goodrich and Rosati, P.C. ("**WSGR**"), outside intellectual property counsel for the Company, dated the Closing Date, in form and substance reasonably satisfactory to the Representatives.

(e) The Underwriters shall have received on the Closing Date an opinion and a negative assurance letter of Davis Polk & Wardwell LLP ("**Davis Polk**"), counsel for the Underwriters, dated the Closing Date, in form and substance reasonably satisfactory to the Representatives.

With respect to Sections 5(c) and 5(e) above, Cooley and Davis Polk may state that their opinions and beliefs are based upon their participation in the preparation of the Registration Statement, the Time of Sale Prospectus and the Prospectus and any amendments or supplements thereto and review and discussion of the contents thereof, but are without independent check or verification, except as specified.

The opinion and negative assurance letter of Cooley described in Section 5(c) and the opinion of WSGR described in Section 5(d) above shall be rendered to the Underwriters at the request of the Company and shall so state therein.

(f) The Underwriters shall have received, on each of the date hereof and the Closing Date, a letter dated the date hereof or the Closing Date, as the case may be, in form and substance reasonably satisfactory to the Underwriters, from Deloitte & Touche LLP, independent public accountants, containing statements and information of the type ordinarily included in accountants' "comfort letters" to underwriters with respect to the financial statements and certain financial information contained in the Registration Statement, the Time of Sale Prospectus and the Prospectus; *provided* that the letter delivered on the Closing Date shall use a "cut-off date" not earlier than the date hereof.

(g) The "lock-up" agreements, each substantially in the form of Exhibit A hereto, between the Representatives and certain shareholders, officers and directors of the Company relating to sales and certain other dispositions of shares of Common Stock or certain other securities, delivered to the Representatives on or before the date hereof, shall be in full force and effect on the Closing Date.

(h) The several obligations of the Underwriters to purchase Additional Shares hereunder are subject to the delivery to the Underwriters on the applicable Option Closing Date of the following:

(i) a certificate, dated the Option Closing Date and signed on behalf of the Company by an executive officer of the Company, confirming that the certificate delivered on the Closing Date pursuant to Section 5(b) hereof remains true and correct as of such Option Closing Date;

(ii) an opinion and negative assurance letter of Cooley, outside counsel for the Company, dated the Option Closing Date, relating to the Additional Shares to be purchased on such Option Closing Date and otherwise to the same effect as the opinion and negative assurance letter required by Section 5(c) hereof;

(iii) an opinion of WSGR, outside intellectual property counsel for the Company, dated the Option Closing Date, to the same effect as the opinion required by Section 5(d) hereof.

(iv) an opinion and negative assurance letter of Davis Polk, counsel for the Underwriters, dated the Option Closing Date, relating to the Additional Shares to be purchased on such Option Closing Date and otherwise to the same effect as the opinion and negative assurance letter required by Section 5(e) hereof;

(v) a letter dated the Option Closing Date, in form and substance reasonably satisfactory to the Representatives, from Deloitte & Touche LLP, independent public accountants, substantially in the same form and substance as the letter furnished to the Underwriters pursuant to Section 5(g) hereof; *provided* that the letter delivered on the Option Closing Date shall use a "cut-off date" not earlier than three business days prior to such Option Closing Date; and

(vi) such other documents as the Representatives may reasonably request with respect to the good standing of the Company, the due authorization and issuance of the Additional Shares to be sold on such Option Closing Date and other matters related to the issuance of such Additional Shares.

6. *Covenants of the Company*. The Company covenants with each Underwriter as follows:

(a) To furnish to the Representatives, without charge, five signed copies of the Registration Statement (including exhibits thereto) and for delivery to each other Underwriter a conformed copy of the Registration Statement (without exhibits thereto) and to furnish to the Representatives in New York City, without charge, prior to 10:00 a.m. New York City time on the business day next succeeding the date of this Agreement and during the period mentioned in Section 6(e) or 6(f) below, as many copies of the Time of Sale Prospectus, the Prospectus and any supplements and amendments thereto or to the Registration Statement as the Representatives may reasonably request.

(b) Before amending or supplementing the Registration Statement, the Time of Sale Prospectus or the Prospectus, to furnish to the Representatives a copy of each such proposed amendment or supplement and not to file any such proposed amendment or supplement to which the Representatives reasonably object, and to file with the Commission within the applicable period specified in Rule 424(b) under the Securities Act any prospectus required to be filed pursuant to such Rule.

(c) To furnish to the Representatives a copy of each proposed free writing prospectus to be prepared by or on behalf of, used by, or referred to by the Company and not to use or refer to any proposed free writing prospectus to which the Representatives reasonably object.

(d) Not to take any action that would result in an Underwriter or the Company being required to file with the Commission pursuant to Rule 433(d) under the Securities Act a free writing prospectus prepared by or on behalf of the Underwriter that the Underwriter otherwise would not have been required to file thereunder.

(e) If the Time of Sale Prospectus is being used to solicit offers to buy the Shares at a time when the Prospectus is not yet available to prospective purchasers and any event shall occur or condition exist as a result of which it is necessary to amend or supplement the Time of Sale Prospectus in order to make the statements therein, in the light of the circumstances, not misleading, or if any event shall occur or condition exist as a result of which the Time of Sale Prospectus conflicts with the information contained in the Registration Statement then on file, or if, in the opinion of counsel for the Underwriters, it is necessary to amend or supplement the Time of Sale Prospectus to comply with applicable law, forthwith to prepare, file with the Commission and furnish, at its own expense, to the Underwriters and to any dealer upon request, either amendments or supplements to the Time of Sale Prospectus so that the statements in the Time of Sale Prospectus as so amended or supplemented will not, in the light of the circumstances when the Time of Sale Prospectus is delivered to a prospective purchaser, be misleading or so that the Time of Sale Prospectus, as amended or supplemented, will no longer conflict with the Registration Statement, or so that the Time of Sale Prospectus, as amended or supplemented, will comply with applicable law.

(f) If, during such period after the first date of the public offering of the Shares as in the opinion of counsel for the Underwriters the Prospectus (or in lieu thereof the notice referred to in Rule 173(a) of the Securities Act) is required by law to be delivered in connection with sales by an Underwriter or dealer, any event shall occur or condition exist as a result of which it is necessary to amend or supplement the Prospectus in order to make the statements therein, in the light of the circumstances when the Prospectus (or in lieu thereof the notice referred to in Rule 173(a) of the Securities Act) is delivered to a purchaser, not misleading, or if, in the opinion of counsel for the Underwriters, it is necessary to amend or supplement the Prospectus to comply with applicable law, forthwith to prepare, file with the Commission and furnish, at its own expense, to the Underwriters and to the dealers (whose names and addresses the Representatives will furnish to the Company) to which Shares may have been sold by the Representatives on behalf of the Underwriters and to any other dealers upon request, either amendments or supplements to the Prospectus so that the statements in the Prospectus as so amended or supplemented will not, in the light of the circumstances when the Prospectus (or in lieu thereof the notice referred to in Rule 173(a) of the Securities Act) is delivered to a purchaser, be misleading or so that the Prospectus, as amended or supplemented, will comply with applicable law.

(g) To endeavor to qualify the Shares for offer and sale under the securities or Blue Sky laws of such jurisdictions as the Representatives shall reasonably request; provided, however, that nothing contained herein shall require the Company to qualify to do business in any jurisdiction, to execute or file a general consent to service of process in any jurisdiction or to subject itself to taxation in any jurisdiction in which it is not otherwise subject.

(h) To make generally available (which may be satisfied by filing with the Commission on its Electronic Data Gathering Analysis and Retrieval System) to the Company's security holders and to the Underwriters as soon as practicable an earnings statement covering a period of at least twelve months beginning with the first fiscal quarter of the Company occurring after the date of this Agreement which shall satisfy the provisions of Section 11(a) of the Securities Act and the rules and regulations of the Commission thereunder.

(i) Whether or not the transactions contemplated in this Agreement are consummated or this Agreement is terminated, the Company hereby agrees to pay or cause to be paid all expenses incident to the performance of its obligations under this Agreement, including: (i) the fees, disbursements and expenses of the Company's counsel and the Company's accountants in connection with the registration and delivery of the Shares under the Securities Act and all other fees or expenses in connection with the preparation and filing of the Registration Statement, any preliminary prospectus, the Time of Sale Prospectus, the Prospectus, any free writing prospectus prepared by or on behalf of, used by, or referred to by the Company and amendments and supplements to any of the foregoing, including all printing costs associated therewith, and the mailing and delivering of copies thereof to the Underwriters and dealers, in the quantities hereinabove specified, (ii) all costs and expenses related to the transfer and delivery of the Shares to the Underwriters, including any transfer or other taxes payable thereon, (iii) the reasonable, documented

cost of printing or producing any Blue Sky or Legal Investment memorandum in connection with the offer and sale of the Shares under state securities laws and all expenses in connection with the qualification of the Shares for offer and sale under state securities laws as provided in Section 6(g) hereof, including filing fees and the reasonable, documented fees and disbursements of counsel for the Underwriters in connection with such qualification and in connection with the Blue Sky or Legal Investment memorandum, (iv) all filing fees and the reasonable fees and disbursements of counsel to the Underwriters incurred in connection with the review and qualification of the offering of the Shares by FINRA (provided, that the amount payable by the Company with respect to fees and disbursements of counsel for the Underwriters pursuant to subsections (iii) and (iv) shall not exceed $37,500), (v) all fees and expenses in connection with the preparation and filing of the registration statement on Form 8-A relating to the Common Stock and all costs and expenses incident to listing the Shares on the Nasdaq Global Market, (vi) the cost of printing certificates, if any, representing the Shares, (vii) the costs and charges of any transfer agent, registrar or depositary, (viii) the costs and expenses of the Company relating to investor presentations on any "road show" undertaken in connection with the marketing of the offering of the Shares, including, without limitation, expenses associated with the preparation or dissemination of any electronic road show, expenses associated with the production of road show slides and graphics, fees and expenses of any consultants engaged in connection with the road show presentations with the prior approval of the Company, travel and lodging expenses of the representatives (other than the Underwriters) and officers of the Company and any such consultants, and fifty percent (50%) of the cost of any aircraft chartered in connection with the road show (with the Underwriters agreeing to pay for the other fifty percent (50%) of the cost of the aircraft, as well as any other travel and lodging expenses of the Underwriters in connection with the road show), (ix) the document production charges and expenses associated with printing this Agreement; (x) all 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 (xi) all other costs and expenses incident to the performance of the obligations of the Company hereunder for which provision is not otherwise made in this Section. It is understood, however, that except as provided in this Section, Section 8 entitled "Indemnity and Contribution," Section 9 entitled "Directed Share Program Indemnification" and the last paragraph of Section 11 below, the Underwriters will pay all of their costs and expenses, including fees and disbursements of their counsel, stock transfer taxes payable on resale of any of the Shares by them and any advertising expenses connected with any offers they may make.

(j) The Company will deliver to each Underwriter (or its agent), on the date of execution of this Agreement, 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 each Underwriter may reasonably request in connection with the verification of the foregoing Certification.

(k) The Company will promptly notify the Representatives if the Company ceases to be an Emerging Growth Company at any time prior to the later of (a) completion of the distribution of the Shares within the meaning of the Securities Act and (b) completion of the Restricted Period (as defined in this Section 6).

(l) If at any time following the distribution of any Written Testing-the-Waters Communication there occurred or occurs an event or development as a result of which such Written Testing-the-Waters Communication included or would include an untrue statement of a material fact or omitted or would omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances existing at that subsequent time, not misleading, the Company will promptly notify the Representatives and will promptly amend or supplement, at its own expense, such Written Testing-the-Waters Communication to eliminate or correct such untrue statement or omission.

(m) 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.

The Company also covenants with each Underwriter that, without the prior written consent of the Representatives on behalf of the Underwriters, it will not, during the period ending 180 days after the date of the Prospectus (the "**Restricted Period**"), (1) offer, pledge, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase, lend, or otherwise transfer or dispose of, directly or indirectly, any shares of Common Stock or any securities convertible into or exercisable or exchangeable for Common Stock or (2) enter into any swap or other arrangement that transfers to another, in whole or in part, any of the economic consequences of ownership of the Common Stock, whether any such transaction described in clause (1) or (2) above is to be settled by delivery of Common Stock or such other securities, in cash or otherwise or (3) file any registration statement with the Commission relating to the offering of any shares of Common Stock or any securities convertible into or exercisable or exchangeable for Common Stock.

The restrictions contained in the preceding paragraph shall not apply to (a) the Shares to be sold hereunder, (b) the issuance by the Company of shares of Common Stock or securities convertible into or exercisable for Common Stock pursuant to the conversion or exchange of convertible or exchangeable securities or the exercise of warrants or options (including net exercise), in each case outstanding on the date hereof and described in the Time of Sale Prospectus, (c) grants of stock options, stock awards, restricted stock or other equity awards and the issuance of Common Stock or securities convertible into or exercisable for Common Stock (whether upon the exercise of stock options or otherwise) to employees, officers, directors, advisors, or consultants of the Company pursuant to the terms of an equity compensation plan in effect on the date hereof and described in the Time of Sale Prospectus provided that, prior to the issuance of any such shares or the grant of any such options, the Company shall cause each recipient of such grant or issuance to execute and deliver a "lock-up" agreement, substantially in the form of Exhibit A hereto, (d) the issuance of or entry into an agreement providing for the issuance of Common Stock or securities convertible into, exercisable for or which are otherwise exchangeable for or represent the right to receive Common Stock in connection with (x) the acquisition by the Company or any of its subsidiaries of the securities, business, technology, property or other assets of another person or entity or pursuant to an employee benefit plan assumed by the Company in connection with such acquisition or (y) the Company's joint ventures, commercial relationships and other strategic transactions, *provided* that the aggregate number of shares of Common Stock (including shares of

Common Stock issuable in respect of securities convertible into, exercisable for or which are otherwise exchangeable for or represent the right to receive Common Stock) that the Company may issue or agree to issue pursuant to this clause (d) shall not exceed 5% of the total number of shares of Common Stock outstanding as of the Closing Date immediately following the completion of the transactions contemplated by this Agreement to be completed as of that date and all recipients of any such securities shall enter into a "lock-up" agreement, substantially in the form of Exhibit A hereto covering the remainder of the Restricted Period, (e) the establishment or amendment of a trading plan pursuant to Rule 10b5-1 under the Exchange Act for the transfer of shares of Common Stock, *provided* that (i) such plan or amendment does not provide for the transfer of Common Stock during the Restricted Period and (ii) to the extent a public announcement or filing under the Exchange Act, if any, is required of or voluntarily made by the Company regarding the establishment or amendment of such plan, such announcement or filing shall include a statement to the effect that no transfer of Common Stock may be made under such plan during the Restricted Period, or (f) the filing of any registration statement on Form S-8 relating to securities granted or to be granted pursuant to any equity compensation plan in effect on the date hereof and described in the Time of Sale Prospectus or any assumed employee benefit plan contemplated by clause (d).

If the Representatives, in their sole discretion, agree to release or waive the restrictions set forth in a lock-up letter described in Section 5(f) 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 Exhibit B hereto through a major news service or any other method that satisfies the obligations described in FINRA Rule 5131(d)(2) at least two business days before the effective date of the release or waiver, if required by FINRA Rule 5131.

7. *Covenants of the Underwriters*. Each Underwriter severally covenants with the Company not to take any action that would result in the Company being required to file with the Commission under Rule 433(d) a free writing prospectus prepared by or on behalf of such Underwriter that otherwise would not be required to be filed by the Company thereunder, but for the action of the Underwriter.

8. *Indemnity and Contribution.* (a) The Company agrees to indemnify and hold harmless each Underwriter, each person, if any, who controls any Underwriter within the meaning of either Section 15 of the Securities Act or Section 20 of the Exchange Act and each affiliate of any Underwriter within the meaning of Rule 405 under the Securities Act from and against any and all losses, claims, damages and liabilities (including, without limitation, any legal or other expenses reasonably incurred in connection with defending or investigating any such action or claim) caused by any untrue statement or alleged untrue statement of a material fact contained in the Registration Statement or any amendment thereof, any preliminary prospectus, the Time of Sale Prospectus or any amendment or supplement thereto, any "issuer free writing prospectus" as defined in Rule 433(h) under the Securities Act, any Company information that the Company has filed, or is required to file, pursuant to Rule 433(d) under the Securities Act, any "road show" as defined in Rule 433(h) under the Securities Act (a "road show"), or the Prospectus or any amendment or supplement thereto, or any Written Testing-the-Waters Communication caused by any omission or alleged omission

to state therein a material fact required to be stated therein or necessary to make the statements therein not misleading, except insofar as such losses, claims, damages or liabilities are caused by any such untrue statement or omission or alleged untrue statement or omission based upon information relating to any Underwriter furnished to the Company in writing by or on behalf of any such Underwriter through the Representatives expressly for use therein.

(a) Each Underwriter agrees, severally and not jointly, to indemnify and hold harmless the Company, its directors, its officers who sign the Registration Statement and each person, if any, who controls the Company within the meaning of either Section 15 of the Securities Act or Section 20 of the Exchange Act to the same extent as the foregoing indemnity from the Company to such Underwriter, but only with reference to information relating to such Underwriter furnished to the Company in writing by such Underwriter through the Representatives expressly for use in the Registration Statement, any preliminary prospectus, the Time of Sale Prospectus, any issuer free writing prospectus, road show or the Prospectus or any amendment or supplement thereto.

(b) In case any proceeding (including any governmental investigation) shall be instituted involving any person in respect of which indemnity may be sought pursuant to Section 8(a) or 8(b), such person (the "**indemnified party**") shall promptly notify the person against whom such indemnity may be sought (the "**indemnifying party**") in writing and the indemnifying party, upon request of the indemnified party, shall retain counsel reasonably satisfactory to the indemnified party to represent the indemnified party and any others the indemnifying party may designate in such proceeding and shall pay the reasonably incurred, documented fees and disbursements of such counsel related to such proceeding. In any such proceeding, any indemnified party shall have the right to retain its own counsel, but the fees and expenses of such counsel shall be at the expense of such indemnified party unless (i) the indemnifying party and the indemnified party shall have mutually agreed in writing to the retention of such counsel, (ii) the named parties to any such proceeding (including any impleaded parties) include both the indemnifying party and the indemnified party and representation of both parties by the same counsel would be inappropriate due to actual or potential differing interests between them or (iii) the indemnified party 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 indemnifying party. It is understood that the indemnifying party shall not, in respect of the legal expenses of any indemnified party 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 such indemnified parties and that all such fees and expenses shall be reimbursed as they are incurred. Such firm shall be designated in writing by the Representatives, in the case of parties indemnified pursuant to Section 8(a), and by the Company, in the case of parties indemnified pursuant to Section 8(b). The indemnifying party shall not be liable for any settlement of any proceeding effected without its written consent, but if settled with such consent or if there be a final judgment for

the plaintiff, the indemnifying party agrees to indemnify the indemnified party from and against any loss or liability by reason of such settlement or judgment. Notwithstanding the foregoing sentence, if at any time an indemnified party shall have requested an indemnifying party to reimburse the indemnified party for fees and expenses of counsel as contemplated by the second and third sentences of this paragraph, the indemnifying party 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 such indemnifying party of the aforesaid request and (ii) such indemnifying party shall not have reimbursed the indemnified party in accordance with such request prior to the date of such settlement. No indemnifying party shall, without the prior written consent of the indemnified party, effect any settlement of any pending or threatened proceeding in respect of which any indemnified party is or could have been a party and indemnity could have been sought hereunder by such indemnified party, unless such settlement (x) includes an unconditional release of such indemnified party from all liability on claims that are the subject matter of such proceeding and (y) 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.

(c) To the extent the indemnification provided for in Section 8(a) or 8(b) is unavailable to an indemnified party or insufficient in respect of any losses, claims, damages or liabilities referred to therein, then each indemnifying party under such paragraph, in lieu of indemnifying such indemnified party thereunder, shall contribute to the amount paid or payable by such indemnified party as a result of such losses, claims, damages or liabilities (i) 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 hand from the offering of the Shares or (ii) if the allocation provided by clause 8(d)(i) above is not permitted by applicable law, in such proportion as is appropriate to reflect not only the relative benefits referred to in clause 8(d)(i) above but also the relative fault of the Company on the one hand and of the Underwriters on the other hand in connection with the statements or omissions that resulted in such losses, claims, damages or liabilities, 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 hand in connection with the offering of the Shares shall be deemed to be in the same respective proportions as the net proceeds from the offering of the Shares (after deducting underwriting discounts and commissions but before deducting expenses) received by the Company and the total underwriting discounts and commissions received by the Underwriters, in each case as set forth in the table on the cover of the Prospectus, bear to the aggregate Public Offering Price of the Shares. The relative fault of the Company on the one hand and the Underwriters on the other hand 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 or by the Underwriters and the parties' relative intent, knowledge, access to information and opportunity to correct or prevent such statement or omission. The Underwriters' respective obligations to contribute pursuant to this Section 8 are several in proportion to the respective number of Shares they have purchased hereunder, and not joint.

(d) The Company and the Underwriters agree that it would not be just or equitable if contribution pursuant to this Section 8 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 that does not take account of the equitable considerations referred to in Section 8(d). The amount paid or payable by an indemnified party as a result of the losses, claims, damages and liabilities referred to in Section 8(d) shall be deemed to include, subject to the limitations set forth above, 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 Section 8, 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 that 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 Securities Act) shall be entitled to contribution from any person who was not guilty of such fraudulent misrepresentation. The remedies provided for in this Section 8 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 this Section 8 and the representations, warranties and other statements of the Company contained in this Agreement 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 Underwriter, any person controlling any Underwriter or any affiliate of any Underwriter or by or on behalf of the Company, its officers or directors or any person controlling the Company and (iii) acceptance of and payment for any of the Shares.

9. *Directed Share Program Indemnification.* (a) The Company agrees to indemnify and hold harmless Morgan Stanley, each person, if any, who controls Morgan Stanley within the meaning of either Section 15 of the Securities Act or Section 20 of the Exchange Act and each affiliate of Morgan Stanley within the meaning of Rule 405 of the Securities Act ("**Morgan Stanley Entities**") from and against any and all losses, claims, damages and liabilities (including, without limitation, any legal or other expenses reasonably incurred in connection with defending or investigating any such action or claim) (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 required to be stated therein or necessary to make the statements therein 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 Morgan Stanley Entities.

(b) In case any proceeding (including any governmental investigation) shall be instituted involving any Morgan Stanley Entity in respect of which indemnity may be sought pursuant to Section 9(a), the Morgan Stanley Entity seeking indemnity, shall promptly notify the Company in writing and the Company, upon request of the Morgan Stanley Entity, shall retain counsel reasonably satisfactory to the Morgan Stanley Entity to represent the Morgan Stanley Entity and any others the Company may designate in such proceeding and shall pay the fees and disbursements of such counsel related to such proceeding. In any such proceeding, any Morgan Stanley 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 Morgan Stanley Entity unless (i) the Company shall have agreed to the retention of such counsel or (ii) the named parties to any such proceeding (including any impleaded parties) include both the Company and the Morgan Stanley 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 Morgan Stanley 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 Morgan Stanley Entities. Any such separate firm for the Morgan Stanley Entities shall be designated in writing by Morgan Stanley. The Company shall not be liable for any settlement of any proceeding effected without its written consent, but if settled with such consent or if there be a final judgment for the plaintiff, the Company agrees to indemnify the Morgan Stanley Entities from and against any loss or liability by reason of such settlement or judgment. Notwithstanding the foregoing sentence, if at any time a Morgan Stanley Entity shall have requested the Company to reimburse it 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 the Morgan Stanley Entity in accordance with such request prior to the date of such settlement. The Company shall not, without the prior written consent of Morgan Stanley, effect any settlement of any pending or threatened proceeding in respect of which any Morgan Stanley Entity is or could have been a party and indemnity could have been sought hereunder by such Morgan Stanley Entity, unless such settlement includes an unconditional release of the Morgan Stanley Entities from all liability on claims that are the subject matter of such proceeding.

(c) To the extent the indemnification provided for in Section 9(a) is unavailable to a Morgan Stanley Entity or insufficient in respect of any losses, claims, damages or liabilities referred to therein, then the Company in lieu of indemnifying the Morgan Stanley Entity thereunder, shall contribute to the amount paid or payable by the Morgan Stanley Entity as a result of such losses, claims, damages or liabilities (i) in such proportion as is appropriate to reflect the relative benefits received by the Company on the one hand and the Morgan Stanley Entities on the other hand from the offering of the Directed Shares or (ii) if the allocation provided by clause 9(c)(i) above is not permitted by applicable law, in such proportion as is appropriate to reflect not only the relative benefits referred to in clause 9(c)(i) above but also the relative fault of the Company on the one hand and of the Morgan Stanley Entities on the other hand in connection with any statements or omissions that resulted in such losses, claims, damages or liabilities, as well as any other relevant equitable considerations. The relative benefits received by the Company on the one hand and the Morgan Stanley 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) and the total underwriting discounts and commissions received by the Morgan Stanley 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 a 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 Morgan Stanley 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 Morgan Stanley 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 Morgan Stanley Entities agree that it would not be just or equitable if contribution pursuant to this Section 9 were determined by pro rata allocation (even if the Morgan Stanley 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 9(c). The amount paid or payable by the Morgan Stanley Entities as a result of the losses, claims, damages and liabilities 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 Morgan Stanley Entities in connection with investigating or defending any such action or claim. Notwithstanding the provisions of this Section 9, no Morgan Stanley 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 Morgan Stanley Entity has otherwise been required to pay. The remedies provided for in this Section 9 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 this Section 9 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 Morgan Stanley 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.

10. *Termination*. The Underwriters may terminate this Agreement by notice given by the Representatives to the Company, if after the execution and delivery of this Agreement and prior to the Closing Date (i) trading generally shall have been suspended or materially limited on, or by, as the case may be, any of the New York Stock Exchange, the NYSE MKT, the Nasdaq Global Market, the Chicago Board of Options Exchange, the Chicago Mercantile Exchange or the Chicago Board of Trade, (ii) trading of any securities of the Company shall have been suspended on any exchange or in any over-the-counter market, (iii) a material disruption in securities settlement, payment or clearance services in the United States shall have occurred, (iv) any moratorium on commercial banking activities shall have been declared by Federal or New York State authorities or (v) there shall have occurred any outbreak or escalation of hostilities, or any change in financial markets or any calamity or crisis that, in the Representatives' judgment, is material and adverse and which, singly or together with any other event specified in this clause (v), makes it, in the Representatives' judgment, impracticable or inadvisable to proceed with the offer, sale or delivery of the Shares on the terms and in the manner contemplated in the Time of Sale Prospectus or the Prospectus.

11. *Effectiveness; Defaulting Underwriters*. This Agreement shall become effective upon the execution and delivery hereof by the parties hereto.

If, on the Closing Date or an Option Closing Date, as the case may be, any one or more of the Underwriters shall fail or refuse to purchase Shares that it has or they have agreed to purchase hereunder on such date, and the aggregate number of Shares which such defaulting Underwriter or Underwriters agreed but failed or refused to purchase is not more than one-tenth of the aggregate number of the Shares to be purchased on such date, the other Underwriters shall be obligated severally in the proportions that the number of Firm Shares set forth opposite their respective names in Schedule I bears to the aggregate number of Firm Shares set forth opposite the names of all such non-defaulting Underwriters, or in such other proportions as the Representatives may specify, to purchase the Shares which such defaulting Underwriter or Underwriters agreed but failed or refused to purchase on such date; *provided* that in no event shall the number of Shares that any Underwriter has agreed to purchase pursuant to this Agreement be increased pursuant to this Section 11 by an amount in excess of one-ninth of such number of Shares without the written consent of such Underwriter. If, on the Closing Date, any Underwriter or Underwriters shall fail or refuse to purchase Firm Shares and the aggregate number of Firm Shares with respect to which such default occurs is more than one-tenth of the aggregate number of Firm Shares to be purchased on such date, and arrangements satisfactory to the Representatives and the Company for the purchase of such Firm Shares are not made within 36 hours after such default, this Agreement shall terminate without liability on the part of any non-defaulting Underwriter or the Company. In any such case either the Representatives or the Company shall have the right to postpone the Closing Date, but in no event for longer than seven days, in

order that the required changes, if any, in the Registration Statement, in the Time of Sale Prospectus, in the Prospectus or in any other documents or arrangements may be effected. If, on an Option Closing Date, any Underwriter or Underwriters shall fail or refuse to purchase Additional Shares and the aggregate number of Additional Shares with respect to which such default occurs is more than one-tenth of the aggregate number of Additional Shares to be purchased on such Option Closing Date, the non-defaulting Underwriters shall have the option to (i) terminate their obligation hereunder to purchase the Additional Shares to be sold on such Option Closing Date or (ii) purchase not less than the number of Additional Shares that such non-defaulting Underwriters would have been obligated to purchase in the absence of such default. Any action taken under this paragraph shall not relieve any defaulting Underwriter from liability in respect of any default of such Underwriter under this Agreement.

If this Agreement shall be terminated by the Underwriters, or any of them, because of any failure or refusal on the part of the Company to comply with the terms or to fulfill any of the conditions of this Agreement, or if for any reason the Company shall be unable to perform its obligations under this Agreement, the Company will reimburse the Underwriters or such Underwriters as have so terminated this Agreement with respect to themselves, severally, for all out-of-pocket expenses (including the fees and disbursements of their counsel) reasonably incurred by such Underwriters in connection with this Agreement or the offering contemplated hereunder.

12. *Entire Agreement*. (a) This Agreement, together with any contemporaneous written agreements and any prior written agreements (to the extent not superseded by this Agreement) that relate to the offering of the Shares, represents the entire agreement between the Company and the Underwriters with respect to the preparation of any preliminary prospectus, the Time of Sale Prospectus, the Prospectus, the conduct of the offering, and the purchase and sale of the Shares.

(b) The Company acknowledges that in connection with the offering of the Shares: (i) the Underwriters have acted at arms' length, are not agents of, and owe no fiduciary duties to, the Company or any other person, (ii) the Underwriters owe the Company only those duties and obligations set forth in this Agreement and prior written agreements (to the extent not superseded by this Agreement), if any, and (iii) the Underwriters may have interests that differ from those of the Company. The Company waives to the full extent permitted by applicable law any claims it may have against the Underwriters arising from an alleged breach of fiduciary duty in connection with the offering of the Shares.

13. *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.

For purposes of this Section a "**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.

14. *Counterparts*. This Agreement may be signed in two or more counterparts, each of which shall be an original, with the same effect as if the signatures thereto and hereto were upon the same instrument. Counterparts may be delivered via facsimile, electronic mail (including any electronic signature complying with the U.S. federal ESIGN Act of 2000, Uniform Electronic Transactions Act or other applicable law, e.g., www.docusign.com) or other transmission method and any counterpart so delivered shall be deemed to have been duly and validly delivered and be valid and effective for all purposes.

15. *Applicable Law*. This Agreement and any claim, controversy or dispute relating to or arising out of this Agreement shall be governed by and construed in accordance with the internal laws of the State of New York.

16. *Headings*. The headings of the sections of this Agreement have been inserted for convenience of reference only and shall not be deemed a part of this Agreement.

17. *Notices*. All communications hereunder shall be in writing and effective only upon receipt and if to the Underwriters shall be delivered, mailed or sent to the Representatives in care of Morgan Stanley & Co. LLC, 1585 Broadway, New York, New York 10036, Attention: Equity Syndicate Desk, with a copy to the Legal Department; in care of BofA Securities, Inc. at One Bryant Park, New York, New York 10036, attention of Syndicate Department (facsimile: (646) 855-3073), with a copy to ECM Legal (facsimile: (212) 230-8730); and in care of Cowen and Company, LLC, 599 Lexington Avenue, New York, NY 10022 Attention: Head of Equity Capital Markets, with a copy to the General Counsel and if to the Company shall be delivered, mailed or sent to Personalis, Inc., 1330 O'Brien Drive, Menlo Park, CA 94025, Attention: Chief Financial Officer.

(signature pages follow)

Very truly yours,

Personalis, Inc.

By: _____
Name:
Title:

(Signature Page to Underwriting Agreement)

Accepted as of the date hereof

Morgan Stanley & Co. LLC
BofA Securities, Inc.
Cowen and Company, LLC

Acting severally on behalf of themselves and
the several Underwriters named in Schedule I hereto.

By: Morgan Stanley & Co. LLC

By: _____
Name:
Title:

By: BofA Securities, Inc.

By: _____
Name:
Title:

By: Cowen and Company, LLC

By: _____
Name:
Title:

SCHEDULE I

Underwriter	Number of Firm Shares To Be Purchased
Morgan Stanley & Co. LLC	[•]
BofA Securities, Inc.	[•]
Cowen and Company, LLC	[•]
Oppenheimer & Co. Inc.	[•]
Total:	[•]

SCHEDULE II

Time of Sale Prospectus

1. Preliminary Prospectus issued [date]

2. [identify all free writing prospectuses filed by the Company under Rule 433(d) of the Securities Act]

3. [free writing prospectus containing a description of terms that does not reflect final terms, if the Time of Sale Prospectus does not include a final term sheet]

4. [orally communicated pricing information such as price per share and size of offering if a Rule 134 pricing term sheet is used at the time of sale instead of a pricing term sheet filed by the Company under Rule 433(d) as a free writing prospectus]

[FORM OF LOCK-UP LETTER]

_____, 2019

Morgan Stanley & Co. LLC
Merrill Lynch, Pierce, Fenner & Smith
Incorporated
Cowen and Company, LLC

c/o Morgan Stanley & Co. LLC
1585 Broadway
New York, NY 10036

c/o Merrill Lynch, Pierce, Fenner & Smith
Incorporated
One Bryant Park
New York, NY 10036

c/o Cowen and Company, LLC
599 Lexington Avenue, 20th Floor
New York, NY 10022

Ladies and Gentlemen:

The undersigned understands that Morgan Stanley & Co. LLC, Merrill Lynch, Pierce, Fenner & Smith Incorporated and Cowen and Company, LLC (together, the "**Representatives**") propose to enter into an Underwriting Agreement (the "**Underwriting Agreement**") with Personalis, Inc., a Delaware corporation (the "**Company**"), providing for the public offering (the "**Public Offering**") by the several Underwriters, including the Representatives (the "**Underwriters**"), of shares (the "**Shares**") of the common stock, $0.0001 par value per share, of the Company (the "**Common Stock**").

To induce the Underwriters that may participate in the Public Offering to continue their efforts in connection with the Public Offering, the undersigned hereby agrees that, without the prior written consent of the Representatives on behalf of the Underwriters, it will not, during the period commencing on the date hereof and ending 180 days after the date of the final prospectus (the "**Restricted Period**") relating to the Public Offering (the "**Prospectus**"), (1) offer, pledge, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase, lend, or otherwise transfer or dispose of, directly or indirectly, any shares of Common Stock beneficially owned (as such term is used in Rule 13d-3 of the Securities

Exchange Act of 1934, as amended (the "**Exchange Act**")), by the undersigned or any other securities so owned convertible into or exercisable or exchangeable for Common Stock or (2) enter into any swap or other arrangement that transfers to another, in whole or in part, any of the economic consequences of ownership of the Common Stock, whether any such transaction described in clause (1) or (2) above is to be settled by delivery of Common Stock or such other securities, in cash or otherwise. The foregoing sentence shall not apply to:

(a) transactions relating to shares of Common Stock or other securities acquired in the Public Offering or in open market transactions after the completion of the Public Offering, *provided* that no public announcement or filing under Section 16(a) of the Exchange Act, or any other public filing or disclosure shall be required or shall be voluntarily made in connection with subsequent sales of Common Stock or other securities acquired in the Public Offering or in such open market transactions;

(b) transfers of shares of Common Stock or any security convertible into or exercisable or exchangeable for Common Stock (i) as a bona fide gift, (ii) upon death or by will, testamentary document or intestate succession, (iii) to an immediate family member of the undersigned or to any trust for the direct or indirect benefit of the undersigned or the immediate family of the undersigned (for purposes of this agreement, "immediate family" shall mean any spouse or domestic partner and relationship by blood, current or former marriage or adoption, not more remote than first cousin) or (iv) if the undersigned is a trust, to any beneficiary of the undersigned or the estate of any such beneficiary;

(c) distributions, transfers or dispositions of shares of Common Stock or any security convertible into or exercisable or exchangeable for Common Stock (i) to another corporation, partnership, limited liability company, trust or other business entity that is an affiliate (as defined in Rule 405 promulgated under the Securities Act of 1933, as amended) of the undersigned, or to any investment fund or other entity controlled or managed by the undersigned or affiliates of the undersigned, or (ii) as part of a distribution, transfer or disposition without consideration by the undersigned to its stockholders, current or former partners (general or limited), members, beneficiaries or other equity holders, or to the estates of any such stockholders, partners, members, beneficiaries or other equity holders;

(d) (i) the receipt by the undersigned from the Company of shares of Common Stock upon the exercise of options or other equity awards granted under a stock incentive plan or other equity award plan, which plan is described in the registration statement related to the Public Offering (the "**Registration Statement**"), or the exercise of warrants outstanding and which are described in the Registration Statement or the Prospectus, or (ii) the transfer of shares of Common Stock or any securities convertible into Common Stock to the Company upon a vesting or settlement event of the Company's securities or upon the exercise of options or warrants to purchase the Company's securities on a "cashless" or "net exercise" basis to the extent permitted by the instruments representing such options or warrants (and any transfer to the Company necessary in respect of such amount needed for the payment of taxes, including estimated taxes, due as a result of

such vesting or exercise whether by means of a "net settlement" or otherwise) so long as such "cashless" exercise or "net exercise" is effected solely by the surrender of outstanding options or warrants (or the Common Stock issuable upon the exercise thereof) to the Company and the Company's cancellation of all or a portion thereof to pay the exercise price and/or withholding tax and remittance obligations; *provided* (x) the shares received upon exercise of the option or warrant are subject to the terms of this agreement, and (y) that in the case of either (i) or (ii), no public announcement or filing under Section 16(a) of the Exchange Act, or any other public filing or disclosure of such receipt or transfer, shall be required or shall be voluntarily made by or on behalf of the undersigned within 60 days after the date of the Prospectus, and after such 60th day and during the Restricted Period, any filing under Section 16(a) of the Exchange Act shall clearly indicate in the footnotes thereto that (A) the filing relates to the circumstances described in (i) or (ii), as the case may be, (B) no shares were sold by the reporting person and (C) in the case of (i) the shares of Common Stock received upon exercise of the option or warrant are subject to a lock-up agreement with the Underwriters of the Public Offering;

(e) the establishment of a trading plan pursuant to Rule 10b5-1 under the Exchange Act for the transfer of shares of Common Stock, *provided* that (i) such plan does not provide for the transfer of Common Stock during the Restricted Period and (ii) to the extent a public announcement or filing under the Exchange Act, if any, is required of or voluntarily made by or on behalf of the undersigned or the Company regarding the establishment of such plan during the Restricted Period, such announcement or filing shall include a statement to the effect that no transfer of Common Stock may be made under such plan during the Restricted Period;

(f) the transfer of Common Stock or any security convertible into or exercisable or exchangeable for Common Stock that occurs by operation of law pursuant to a qualified domestic order in connection with a divorce settlement or other court order;

(g) any transfer of Common Stock to the Company pursuant to arrangements under which the Company has the option to repurchase such shares or a right of first refusal with respect to transfers of such shares which transfer is otherwise permitted under this agreement;

(h) the conversion of the outstanding preferred stock of the Company into shares of Common Stock prior to or in connection with the consummation of the Public Offering, *provided* that such conversion is described in the Registration Statement and any such shares of Common Stock received upon such conversion shall be subject to the terms of this agreement; and

(i) the transfer of shares of Common Stock or any security convertible into or exercisable or exchangeable for Common Stock pursuant to a bona fide third-party tender offer, merger, consolidation or other similar transaction, that is approved by the Board of Directors of the Company, made to all holders of Common Stock involving a Change of Control (as defined below), *provided* that in the event that the tender offer, merger, consolidation or other such transaction is not completed, the Common Stock owned by the undersigned shall remain subject to the restrictions contained in this agreement;

provided that in the case of any transfer, distribution or disposition pursuant to clause (b), (c) or (f), each transferee, donee or distributee shall sign and deliver a lock-up agreement substantially in the form of this agreement;

provided further that in the case of any transfer, distribution or disposition pursuant to clause (b) or (c), no public announcement or filing under Section 16(a) of the Exchange Act, or any other public filing or disclosure shall be required or shall be voluntarily made during the Restricted Period; and

provided further that in the case of any transfer pursuant to clause (f) or (g), no public announcement or filing under Section 16(a) of the Exchange Act, or any other public filing or disclosure shall be required or shall be voluntarily made during the Restricted Period, unless such filing is required and clearly indicates in the footnotes thereto that the transfer is by operation of law, court order, or in connection with a divorce settlement, or a repurchase by the Company, as the case may be.

For the purposes of clause (i) of the second paragraph hereof, "**Change of Control**" shall mean the consummation of any bona fide third-party tender offer, merger, consolidation or other similar transaction the result of which is that any "person" (as defined in Section 13(d)(3) of the Exchange Act), or group of persons, other than the Company, becomes the beneficial owner (as defined in Rules 13d-3 and 13d-5 of the Exchange Act) of more than 50% of total voting power of the voting stock of the Company.

In addition, the undersigned agrees that, without the prior written consent of the Representatives on behalf of the Underwriters, it will not, during the Restricted Period, make any demand for or exercise any right with respect to, the registration of any shares of Common Stock or any security convertible into or exercisable or exchangeable for Common Stock. The undersigned also agrees and consents to the entry of stop transfer instructions with the Company's transfer agent and registrar against the transfer of the undersigned's shares of Common Stock except in compliance with the foregoing restrictions.

The undersigned agrees that, to the extent that the terms of this agreement conflict with or are in any way inconsistent with any prior investor rights agreement, prior registration rights agreement, prior market standoff agreement or any other prior lock-up or similar prior agreement to which the undersigned and the Company may be a party, this agreement supersedes such prior agreement.

If the undersigned is an officer or director of the Company, the undersigned further agrees that, notwithstanding clause (a) of the second paragraph hereof, the foregoing provisions shall be equally applicable to any issuer-directed Shares the undersigned may purchase in the Public Offering.

If the undersigned is an officer or director of the Company, (i) the Representatives agree that, at least three business days before the effective date of any release or waiver of the foregoing restrictions in connection with a transfer of shares of Common Stock, the Representatives will notify the Company of the impending release or waiver, and (ii) the Company has agreed in the Underwriting Agreement to announce the impending release or waiver by press release through a major news service at least two business days before the effective date of the release or waiver. Any release or waiver granted by the Representatives hereunder to any such officer or director shall only be effective two business days after the publication date of such press release. The provisions of this paragraph will not apply if (a) the release or waiver is effected solely to permit a transfer not for consideration and (b) the transferee has agreed in writing to be bound by the same terms described in this letter to the extent and for the duration that such terms remain in effect at the time of the transfer.

The undersigned understands that the Company and the Underwriters are relying upon this agreement in proceeding toward consummation of the Public Offering. The undersigned further understands that this agreement is irrevocable and shall be binding upon the undersigned's heirs, legal representatives, successors and assigns.

Notwithstanding anything to the contrary contained herein, this agreement will automatically terminate and the undersigned will be released from all of his, her or its obligations hereunder upon the earliest to occur, if any, of (i) the date that the Company, on the one hand, or the Representatives, on the other hand, advises in writing, prior to the execution of the Underwriting Agreement, that it has determined not to proceed with the Public Offering, (ii) the date that the Company withdraws the Registration Statement, (iii) the date that the Underwriting Agreement is executed but is terminated (other than the provisions thereof which survive termination) prior to payment for and delivery of the Shares to be sold thereunder, or (iv) September 30, 2019, in the event that the Underwriting Agreement has not been executed by such date (provided that the Company may by written notice to the undersigned prior to September 30, 2019 extend such date for a period of up to an additional three months).

The undersigned hereby waives any and all notice requirements and rights with respect to the registration of securities pursuant to any agreement, understanding or anything otherwise setting forth the terms of any security of the Company held by the undersigned, including any registration rights agreement to which the undersigned and the Company may be party; *provided*, *however*, that such waiver shall apply only to the proposed Public Offering, and any other action taken by the Company in connection with the proposed Public Offering.

The undersigned hereby consents to receipt of this agreement in electronic form and understands and agrees that this agreement may be signed electronically. In the event that any signature is delivered by facsimile transmission, electronic mail, or otherwise by electronic transmission evidencing an intent to sign this agreement, such facsimile transmission, electronic mail or other electronic transmission shall create a valid and binding obligation of the undersigned with the same force and effect as if such signature were an original. Execution and delivery of this agreement by facsimile transmission, electronic mail or other electronic transmission is legal, valid and binding for all purposes.

Whether or not the Public Offering actually occurs depends on a number of factors, including market conditions. Any Public Offering will only be made pursuant to an Underwriting Agreement, the terms of which are subject to negotiation between the Company and the Underwriters.

[*Signature page follows*]

Very truly yours,

IF AN INDIVIDUAL:

_____

(duly authorized signature)

Name: _____

(please print full name)

Address:

_____

_____

E-mail: _____

IF AN ENTITY:

_____

(please print complete name of entity)

By: _____

(duly authorized signature)

Name: _____

(please print full name)

Title: _____

(please print full title)

Address:

_____

_____

E-mail:

EXHIBIT B

FORM OF WAIVER OF LOCK-UP

_____, 20__

[Name and Address of
Officer or Director
Requesting Waiver]

Dear Mr./Ms. [Name]:

This letter is being delivered to you in connection with the offering by Personalis, Inc. (the "**Company**") of shares of common stock, $ par value (the "**Common Stock**"), of the Company and the lock-up letter dated , 2019 (the "Lock-up Letter"), executed by you in connection with such offering, and your request for a [waiver] [release] dated , 20 , with respect to shares of Common Stock (the "**Shares**").

Morgan Stanley & Co. LLC, BofA Securities, Inc. and Cowen and Company, LLC hereby agree to [waive] [release] the transfer restrictions set forth in the Lock-up Letter, but only with respect to the Shares, effective , 20 ; provided, however, that such [waiver] [release] is conditioned on the Company announcing the impending [waiver] [release] by press release through a major news service at least two business days before effectiveness of such [waiver] [release]. This letter will serve as notice to the Company of the impending [waiver] [release].

Except as expressly [waived] [released] hereby, the Lock-up Letter shall remain in full force and effect.

Very truly yours,

Morgan Stanley & Co. LLC
BofA Securities, Inc.
Cowen and Company, LLC
Acting severally on behalf of themselves and the several Underwriters named in Schedule I hereto

MORGAN STANLEY & CO. LLC

By: _____
Name:
Title:

BOFA SECURITIES, INC.

By: _____
Name:
Title:

COWEN AND COMPANY, LLC

By: _____
Name:
Title:

cc: Company

FORM OF PRESS RELEASE

Personalis, Inc.
[Date]

Personalis, Inc. (the "**Company**") announced today that Morgan Stanley & Co. LLC, BofA Securities, Inc. and Cowen and Company, LLC the lead book-running managers in the Company's recent public sale of shares of common stock are [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 CERTIFICATE OF INCORPORATION OF PERSONALIS, INC.

The undersigned, John West, hereby certifies that:

ONE: The original name of this corporation is Personalis, Inc. and the date of filing the original Certificate of Incorporation of this corporation with the Secretary of State of the State of Delaware was February 21, 2011.

TWO: He is the duly elected and acting President and Chief Executive Officer of Personalis, Inc., a Delaware corporation.

THREE: The Certificate of Incorporation of this corporation is hereby amended and restated to read as follows:

I.

The name of this corporation is Personalis, Inc. (the "***Company***").

II.

The address of the registered office of this Company in the State of Delaware is 3500 South DuPont Highway, Dover, County of Kent, DE 19901, and the name of the registered agent of this corporation in the State of Delaware at such address is Incorporating Services, Ltd.

III.

The purpose of the Company is to engage in any lawful act or activity for which a corporation may be organized under the Delaware General Corporation Law ("***DGCL***").

IV.

A. The Company is authorized to issue two classes of stock to be designated, respectively, Common Stock and Preferred Stock. The total number of shares that the Company is authorized to issue is 164,538,150 shares, 96,000,000 shares of which shall be Common Stock and 68,538,150 shares of which shall be Preferred Stock (the "***Preferred Stock***"). The Preferred Stock shall have a par value of $0.0001 per share and the Common Stock shall have a par value of $0.0001 per share.

B. The number of authorized shares of Common Stock may be increased or decreased (but not below the number of shares of Common Stock then outstanding) by the affirmative vote of the holders of a majority of the stock of the Company entitled to vote (voting together as a single class on an as-if-converted basis), irrespective of the provisions of Section 242(b)(2) of the DGCL, except as otherwise set forth herein.

C. 31,250,000 of the authorized shares of Preferred Stock are hereby designated "Series A Convertible Preferred Stock" (the "***Series A Preferred***"), 19,288,150 of the authorized shares of Preferred Stock are hereby designated "Series B Convertible Preferred Stock" (the "***Series B Preferred***," and 18,000,000 shares are designated "Series C Convertible Preferred Stock" (the "***Series C Preferred***", together with the Series A Preferred and the Series B Preferred, the "***Series Preferred***").

D. The rights, preferences, privileges, restrictions and other matters relating to the Series Preferred are as follows:

1. DIVIDEND RIGHTS.

(a) Holders of Series Preferred, in preference to the holders of Common Stock, shall be entitled to receive, on a pari passu basis, but only out of funds that are legally available therefor, cash dividends at the rate of eight percent (8%) of the Original Issue Price (as defined below) per annum on each outstanding share of Series Preferred. Such dividends shall be payable only when, as and if declared by the Board of Directors (the "***Board***") and shall be non-cumulative.

(b) The "Original Issue Price" of the Series C Preferred shall be $2.013 per share (as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares often after the filing date hereof). The "Original Issue Price" of the Series B Preferred shall be $1.15 per share (as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares after the filing date hereof). The "Original Issue Price" of the Series A Preferred shall be $0.656 per share (as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares after the filing date hereof).

(c) So long as any shares of Series Preferred are outstanding, the Company shall not pay or declare any dividend (whether in cash or property), or make any other distribution on the Common Stock, or purchase, redeem or otherwise acquire for value any shares of Common Stock, until all dividends as set forth in Section 1(a) above on the Series Preferred shall have been paid or declared and set apart, except for:

(i) acquisitions of Common Stock by the Company, approved by the Board, pursuant to agreements that permit the Company to repurchase such shares at no more than cost upon termination of services to the Company;

(ii) acquisitions of Common Stock in exercise of the Company's right of first refusal to repurchase such shares which are approved by the Company's Board; or

(iii) distributions to holders of Common Stock in accordance with Section 3.

(d) In the event dividends are paid on any share of Common Stock, the Company shall pay an additional dividend on all outstanding shares of Series Preferred in a per share amount equal (on an as-if-converted to Common Stock basis) to the amount paid or set aside for each share of Common Stock.

(e) The provisions of Sections 1(c) and 1(d) shall not apply to a dividend payable solely in Common Stock to which the provisions of Section 4(f) hereof are applicable, or any repurchase of any outstanding securities of the Company that is approved by (i) the Board and (ii) the Series Preferred as may be required by this Certificate of Incorporation.

(f) California General Corporation Law Sections 502 and 503 shall not apply with respect to distributions on shares junior to the Series Preferred as they relate to repurchases of shares of Common Stock upon termination of employment or service as a consultant or director.

2. VOTING RIGHTS.

(a) General Rights. Each holder of shares of the Series Preferred shall be entitled to the number of votes equal to the number of shares of Common Stock into which such shares of Series Preferred could be converted (pursuant to Section 4 hereof) immediately after the close of business on the record date fixed for such meeting or the effective date of such written consent and shall have voting rights and powers equal to the voting rights and powers of the Common Stock and shall be entitled to notice of any stockholders' meeting in accordance with the bylaws of the Company. Except as otherwise provided herein or as required by law, the Series Preferred shall vote together with the Common Stock at any annual or special meeting of the stockholders and not as a separate class, and may act by written consent in the same manner as the Common Stock.

(b) Separate Vote of Series Preferred. For so long as at least 1,000,000 shares of Series Preferred (as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares after the filing date hereof) remain outstanding, in addition to any other vote or consent required herein or by law, the vote or written consent of the holders of a majority of the outstanding Series Preferred shall be necessary for effecting or validating the following actions (whether by merger, recapitalization or otherwise):

(i) Any amendment, alteration or repeal of any provision of the Certificate of Incorporation or Bylaws of the Company (including any filing of a Certificate of Designation) that alters or changes the voting or other powers, preferences or other special rights, privileges or restrictions of the Series Preferred;

(ii) Any increase or decrease in the authorized number of shares of Common Stock or Preferred Stock;

(iii) Any authorization or any designation, whether by reclassification or otherwise, of any new class or series of stock or any other securities convertible into equity securities of the Company ranking on a parity with or senior to the Series Preferred in right of redemption, liquidation preference, voting or dividend rights or any increase in the authorized or designated number of Common Stock, Preferred Stock or any series thereof;

(iv) Any redemption, repurchase, payment or declaration of dividends or other distributions with respect to Common Stock or Preferred Stock other than dividends required pursuant to Section 1 hereof (except for acquisitions of Common Stock by the Company permitted by Section 1(c)(i), (ii) and (iii) hereof);

(v) Any voluntary dissolution or liquidation of the Company;

(vi) Any agreement by the Company or its stockholders regarding an Asset Transfer or Acquisition (each as defined in Section 3 hereof); or

(vii) Any increase or decrease in the authorized number of members of the Company's Board.

(c) Separate Vote of Series C Preferred. For so long as at least 1,000,000 shares of Series C Preferred (as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares after the filing date hereof) remain outstanding, in addition to any other vote or consent required herein or by law, the vote or written consent of the holders of a majority of the outstanding Series C Preferred shall be necessary for effecting or validating (whether by merger, recapitalization or otherwise) (i) any amendment, alteration or repeal of any provision of the Certificate of Incorporation or Bylaws of the Company (including any filing of a Certificate of Designation) that alters or changes the voting or other powers, preferences or other special rights, privileges or restrictions of the Series C Preferred in a manner that adversely affects the interests or rights of the holders of Series C Preferred in a different and disproportionate manner than the other series of Preferred Stock or (ii) any amendment of Section D.4(k)(i)(A) of this Article IV.

(d) Election of Board of Directors.

(i) There shall initially be five members of the Board.

(ii) For so long as any shares of Series Preferred remain outstanding (as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares after the filing date hereof), the holders of Series Preferred, voting as a separate class, shall be entitled to elect three (3) members of the Board at each meeting or pursuant to each consent of the Company's stockholders for the election of directors, and to remove from office such directors and to fill any vacancy caused by the resignation, death or removal of such directors.

(iii) The holders of Common Stock, voting as a separate class, shall be entitled to elect one (1) member of the Board at each meeting or pursuant to each consent of the Company's stockholders for the election of directors, and to remove from office such directors and to fill any vacancy caused by the resignation, death or removal of such directors.

(iv) The holders of Common Stock and Series Preferred, voting together as a single class on an as-if-converted basis, shall be entitled to elect all remaining members of the Board at each meeting or pursuant to each consent of the Company's stockholders for the election of directors, and to remove from office such directors and to fill any vacancy caused by the resignation, death or removal of such directors.

(v) Notwithstanding the provisions of Section 223(a)(1) and 223(a)(2) of the DGCL, any vacancy, including newly created directorships resulting from any increase in the authorized number of directors or amendment of this Amended and Restated Certificate of Incorporation (the "***Restated Certificate***"), and vacancies created by removal or

resignation of a director, may be filled by a majority of the directors then in office, though less than a quorum, or by a sole remaining director, and the directors so chosen shall hold office until the next annual election and until their successors are duly elected and shall qualify, unless sooner displaced; *provided, however*, that where such vacancy occurs among the directors elected by the holders of a class or series of stock, the holders of shares of such class or series may override the Board's action to fill such vacancy by (i) voting for their own designee to fill such vacancy at a meeting of the Company's stockholders or (ii) written consent, if the consenting stockholders hold a sufficient number of shares to elect their designee at a meeting of the stockholders in which all members of such class or series are present and voted. Any director may be removed during his or her term of office without cause, by, and only by, the affirmative vote of the holders of the shares of the class or series of stock entitled to elect such director or directors, given either at a special meeting of such stockholders duly called for that purpose or pursuant to a written consent of stockholders, and any vacancy thereby created may be filled by the holders of that class or series of stock represented at the meeting or pursuant to written consent. At any meeting held for the purpose of electing a director, the presence in person or by proxy of the holders of a majority of the outstanding shares of the class or series entitled to elect such director shall constitute a quorum for the purpose of electing such director.

(vi) No person entitled to vote at an election for directors may cumulate votes to which such person is entitled, unless, at the time of such election, Section 2115 of the California General Corporation Law ("***CGCL***") purports to apply to the Company. During such time or times that Section 2115(b) of the CGCL purports to apply to the Company, every stockholder entitled to vote at an election for directors may cumulate such stockholder's votes and give one candidate a number of votes equal to the number of directors to be elected multiplied by the number of votes to which such stockholder's shares are otherwise entitled, or distribute the stockholder's votes on the same principle among as many candidates as such stockholder desires. No stockholder, however, shall be entitled to so cumulate such stockholder's votes unless (i) the names of such candidate or candidates have been placed in nomination prior to the voting and (ii) the stockholder has given notice at the meeting, prior to the voting, of such stockholder's intention to cumulate such stockholder's votes. If any stockholder has given proper notice to cumulate votes, all stockholders may cumulate their votes for any candidates who have been properly placed in nomination. Under cumulative voting, the candidates receiving the highest number of votes, up to the number of directors to be elected, are elected.

(vii) During such time or times that Section 2115(b) of the CGCL purports to apply to the Company, one or more directors may be removed from office at any time without cause by the affirmative vote of the holders of a majority of the outstanding shares entitled to vote for that director as provided above; *provided, however*, that unless the entire Board is removed, no individual director may be removed when the votes cast against such director's removal, or not consenting in writing to such removal, would be sufficient to elect that director if voted cumulatively at an election at which the same total number of votes were cast (or, if such action is taken by written consent, all shares entitled to vote were voted) and the entire number of directors authorized at the time of such director's most recent election were then being elected.

3. LIQUIDATION RIGHTS.

(a) Upon any liquidation, dissolution, or winding up of the Company, whether voluntary or involuntary (a "***Liquidation Event***"), before any distribution or payment shall be made to the holders of any Common Stock, the holders of Series Preferred shall be entitled to be paid, on a pari passu basis, out of the assets of the Company legally available for distribution (or the consideration received by the Company or its stockholders in an Acquisition) for each share of Series Preferred held by them, an amount per share of Series Preferred equal to the applicable Original Issue Price plus all declared and unpaid dividends on the Series Preferred. If, upon any such Liquidation Event, the assets of the Company shall be insufficient to make payment in full to all holders of Series Preferred of the liquidation preference set forth in this Section 3(a), then such assets (or consideration) shall be distributed among the holders of Series Preferred at the time outstanding, ratably in proportion to the full amounts to which they would otherwise be respectively entitled.

(b) After the payment of the full liquidation preference of the Series Preferred as set forth in Section 3(a) above, the remaining assets of the Company legally available for distribution (or the consideration received by the Company or its stockholders in an Acquisition), if any, shall be distributed ratably to the holders of the Common Stock.

(c) An Asset Transfer or Acquisition (each as defined below) shall be deemed a Liquidation Event for purposes of this Section 3.

(i) For the purposes of this Section 3: (i) "***Acquisition***" shall mean any consolidation or merger of the Company with or into any other corporation or other entity or person, or any other corporate reorganization, other than any such consolidation, merger or reorganization in which the shares of capital stock of the Company immediately prior to such consolidation, merger or reorganization, continue to represent a majority of the voting power of the surviving entity (or, if the surviving entity is a wholly owned subsidiary, its parent) immediately after such consolidation, merger or reorganization, (*provided*, that, for the purpose of this Section 3(c), all shares of Common Stock issuable upon exercise of options outstanding immediately prior to such consolidation or merger or upon conversion of Convertible Securities (as defined below) outstanding immediately prior to such merger or consolidation shall be deemed to be outstanding immediately prior to such merger or consolidation and, if applicable, converted or exchanged in such merger or consolidation on the same terms as the actual outstanding shares of capital stock are converted or exchanged); *provided*, that an Acquisition shall not include any transaction or series of transactions principally for bona fide equity financing purposes in which cash is received by the Company or any successor or indebtedness of the Company is cancelled or converted or a combination thereof; and (ii) "***Asset Transfer***" shall mean a sale, lease, exclusive license or other disposition of all or substantially all of the assets of the Company.

(ii) In any Acquisition or Asset Transfer, if the consideration to be received is securities of a corporation or other property other than cash, its value will be deemed its fair market value as determined in good faith by the Board on the date such determination is made.

(iii) The Company shall not have the power to effect an Acquisition or Asset Transfer unless the definitive agreement for such transaction (the "***Agreement***") provides that the consideration payable to the stockholders of the Company in connection therewith shall be allocated among the holders of capital stock of the Company in accordance with this Section 3.

(d) Notwithstanding the foregoing, upon any Liquidation Event, (including an Acquisition or Asset Transfer), each holder of Series Preferred shall be entitled to receive, for each share of each series of Series Preferred then held, out of the proceeds available for distribution, the greater of: (i) the amount of cash, securities or other property to which such holder would be entitled to receive with respect to such shares in a Liquidation Event pursuant to Section 3(a) (without giving effect to this Section 3(d)) or (ii) the amount of cash, securities or other property to which such holder would be entitled to receive in a Liquidation Event with respect to such shares if such shares had been converted to Common Stock immediately prior to such Liquidation Event or Acquisition or Asset Transfer, giving effect to this Section 3(d) with respect to all Series Preferred simultaneously.

4. CONVERSION RIGHTS.

The holders of the Series Preferred shall have the following rights with respect to the conversion of the Series Preferred into shares of Common Stock (the "***Conversion Rights***"):

(a) Optional Conversion. Subject to and in compliance with the provisions of this Section 4, any shares of Series Preferred may, at the option of the holder, be converted at any time into fully-paid and nonassessable shares of Common Stock. The number of shares of Common Stock to which a holder of Series Preferred shall be entitled upon conversion shall be the product obtained by multiplying the applicable Series Preferred Conversion Rate then in effect (determined as provided in Section 4(b)) by the number of shares of Series Preferred being converted.

(b) Series Preferred Conversion Rate. The conversion rate in effect at any time for conversion of the Series A Preferred (the "***Series A Preferred Conversion Rate***") shall be the quotient obtained by dividing the Original Issue Price of the Series A Preferred by the Series A Preferred Conversion Price, calculated as provided in Section 4(c). The conversion rate in effect at any time for conversion of the Series B Preferred (the "***Series B Preferred Conversion Rate***") shall be the quotient obtained by dividing the Original Issue Price of the Series B Preferred by the Series B Preferred Conversion Price, calculated as provided in Section 4(c). The conversion rate in effect at any time for conversion of the Series C Preferred (the "***Series C Preferred Conversion Rate***") shall be the quotient obtained by dividing the Original Issue Price of the Series C Preferred by the Series C Preferred Conversion Price, calculated as provided in Section 4(c). The Series A Preferred Conversion Rate, the Series B Preferred Conversion Rate and the Series C Preferred Conversion Rate are collectively referred to herein as the "***Series Preferred Conversion Rate***".

(c) Series Preferred Conversion Price. The conversion price for the Series A Preferred shall initially be the Original Issue Price of the Series A Preferred (the "***Series A Preferred Conversion Price***"). The conversion price for the Series B Preferred shall initially be the Original Issue Price of the Series B Preferred (the "***Series B Preferred Conversion Price***"). The conversion price for the Series C Preferred shall initially be the Original Issue Price of the Series C Preferred (the "***Series C Preferred Conversion Price***" and, together with the Series A Preferred Conversion Price and the Series B Preferred Conversion Price, the "***Series Preferred Conversion Price***"). Such initial Series Preferred Conversion Prices shall be adjusted from time to time in accordance with this Section 4. All references to the Series Preferred Conversion Price herein shall mean the Series Preferred Conversion Price as so adjusted.

(d) Mechanics of Optional Conversion. Each holder of Series Preferred who desires to convert the same into shares of Common Stock pursuant to this Section 4 shall surrender the certificate or certificates therefor, duly endorsed, at the office of the Company or any transfer agent for the Series Preferred, and shall give written notice to the Company at such office that such holder elects to convert the same. Such notice shall state the number of shares of Series Preferred being converted. Thereupon, the Company shall promptly issue and deliver at such office to such holder a certificate or certificates for the number of shares of Common Stock to which such holder is entitled and shall promptly pay (i) in cash or, to the extent sufficient funds are not then legally available therefor, in Common Stock (at the Common Stock's fair market value determined in good faith by the Board as of the date of such conversion), any declared and unpaid dividends on the shares of Series Preferred being converted and (ii) in cash (at the Common Stock's fair market value determined in good faith by the Board as of the date of conversion) the value of any fractional share of Common Stock otherwise issuable to any holder of Series Preferred. Such conversion shall be deemed to have been made at the close of business on the date of such surrender of the certificates representing the shares of Series Preferred to be converted, and the person entitled to receive the shares of Common Stock issuable upon such conversion shall be treated for all purposes as the record holder of such shares of Common Stock on such date.

(e) Adjustment for Stock Splits and Combinations. If at any time or from time to time on or after the date that the first share of Series C Preferred is issued (the "***Original Issue Date***") the Company effects a subdivision of the outstanding Common Stock, the Series Preferred Conversion Price in effect immediately before that subdivision shall be proportionately decreased. Conversely, if at any time or from time to time after the Original Issue Date the Company combines the outstanding shares of Common Stock into a smaller number of shares, the Series Preferred Conversion Price in effect immediately before the combination shall be proportionately increased. Any adjustment under this Section 4(e) shall become effective at the close of business on the date the subdivision or combination becomes effective.

(f) Adjustment for Common Stock Dividends and Distributions. If at any time or from time to time on or after the Original Issue Date the Company pays to holders of Common Stock a dividend or other distribution in additional shares of Common Stock, the Series Preferred Conversion Price then in effect shall be decreased as of the time of such issuance, as provided below:

(i) The Series Preferred Conversion Price shall be adjusted by multiplying the applicable Series Preferred Conversion Price then in effect by a fraction equal to:

(A) the numerator of which is the total number of shares of Common Stock issued and outstanding immediately prior to the time of such issuance, and

(B) the denominator of which is the total number of shares of Common Stock issued and outstanding immediately prior to the time of such issuance plus the number of shares of Common Stock issuable in payment of such dividend or distribution;

(ii) If the Company fixes a record date to determine which holders of Common Stock are entitled to receive such dividend or other distribution, the Series Preferred Conversion Price shall be fixed as of the close of business on such record date and the number of shares of Common Stock shall be calculated immediately prior to the close of business on such record date; and

(iii) If such record date is fixed and such dividend is not fully paid or if such distribution is not fully made on the date fixed therefor, the Series Preferred Conversion Price shall be recomputed accordingly as of the close of business on such record date and thereafter the Series Preferred Conversion Price shall be adjusted pursuant to this Section 4(f) to reflect the actual payment of such dividend or distribution.

(g) Adjustment for Reclassification, Exchange, Substitution, Reorganization, Merger or Consolidation. If at any time or from time to time on or after the Original Issue Date the Common Stock issuable upon the conversion of the Series Preferred is changed into the same or a different number of shares of any class or classes of stock, whether by recapitalization, reclassification, merger, consolidation or otherwise (other than an Acquisition as defined in Section 3 or a subdivision or combination of shares or stock dividend provided for elsewhere in this Section 4), in any such event each share of Series Preferred shall thereafter be convertible in lieu of the Common Stock into which it was convertible prior to such event into the kind and amount of securities, cash or other property that a holder of the number of shares of Common Stock of the Company issuable upon conversion of one share of Series Preferred immediately prior to such recapitalization, reclassification, merger, consolidation or other transaction would have been entitled to receive pursuant to such transaction, all subject to further adjustment as provided herein or with respect to such other securities or property by the terms thereof. In any such case, appropriate adjustment shall be made in the application of the provisions of this Section 4 with respect to the rights of the holders of Series Preferred after the capital reorganization to the end that the provisions of this Section 4 (including adjustment of the Series Preferred Conversion Price then in effect and the number of shares issuable upon conversion of the Series Preferred) shall be applicable after that event and be as nearly equivalent as practicable.

(h) Sale of Shares Below Series Preferred Conversion Price.

(i) If at any time or from time to time on or after the Original Issue Date the Company issues or sells, or is deemed by the express provisions of this Section 4(h) to have issued or sold, Additional Shares of Common Stock (as defined below), other than as provided in Section 4(e), 4(f) or 4(g) above, for an Effective Price (as defined below) less than the then effective Series Preferred Conversion Price (a "***Qualifying Dilutive Issuance***"), then and in each such case, the then existing Series Preferred Conversion Price, as applicable, shall be reduced, as of the opening of business on the date of such issue or sale, to a price determined by multiplying the applicable Series Preferred Conversion Price in effect immediately prior to such issuance or sale by a fraction:

(A) the numerator of which shall be (A) the number of shares of Common Stock deemed outstanding (as determined below) immediately prior to such issue or sale, plus (B) the number of shares of Common Stock that the Aggregate Consideration (as defined below) received or deemed received by the Company for the total number of Additional Shares of Common Stock so issued would purchase at such then-existing applicable Series Preferred Conversion Price, and

(B) the denominator of which shall be the number of shares of Common Stock deemed outstanding (as determined below) immediately prior to such issue or sale plus the total number of Additional Shares of Common Stock so issued.

For the purposes of the preceding sentence, the number of shares of Common Stock deemed to be outstanding as of a given date shall be the sum of (A) the number of shares of Common Stock outstanding, (B) the number of shares of Common Stock into which the then outstanding shares of Series Preferred could be converted if fully converted on the day immediately preceding the given date, and (C) the number of shares of Common Stock that are issuable upon the exercise or conversion of all other rights, options and convertible securities outstanding on the day immediately preceding the given date.

(ii) No adjustment shall be made to the Series Preferred Conversion Price in an amount less than one percent (1%) of the applicable Series Preferred Conversion Price then in effect. Any adjustment otherwise required by this Section 4(h) that is not required to be made due to the first sentence of this subsection (ii) shall be included in any subsequent adjustment to the Series Preferred Conversion Price. Any adjustment required by this Section 4(h) shall be rounded to the third decimal for which such rounding represents less than one percent (1%) of the applicable Series Preferred Conversion Price in effect after such adjustment.

(iii) For the purpose of making any adjustment required under this Section 4(h), the aggregate consideration received by the Company for any issue or sale of securities (the "***Aggregate Consideration***") shall be defined as: (A) to the extent it consists of cash, the gross amount of cash received by the Company before deduction of any underwriting or similar commissions, compensation or concessions paid or allowed by the Company in connection with such issue or sale and without deduction of any expenses payable by the Company, (B) to the extent it consists of property other than cash, the fair market value of that property as determined in good faith by the Board, and (C) if Additional Shares of Common Stock, Convertible Securities (as defined below) or rights or options to purchase either Additional Shares of Common Stock or Convertible Securities are issued or sold together with other stock or securities or other assets of the Company for a consideration that covers both, the portion of the consideration so received that may be reasonably determined in good faith by the Board to be allocable to such Additional Shares of Common Stock, Convertible Securities or rights or options.

(iv) For the purpose of the adjustment required under this Section 4(h), if the Company issues or sells (x) Preferred Stock or other stock, options, warrants, purchase rights or other securities exercisable for or convertible into, Additional Shares of Common Stock (such convertible stock or securities being herein referred to as "***Convertible Securities***") or (y) rights or options for the purchase of Additional Shares of Common Stock or Convertible Securities and if the Effective Price of such Additional Shares of Common Stock is less than the applicable Series Preferred Conversion Price, in each case the Company shall be deemed to have issued at the time of the issuance of such rights or options or Convertible Securities the maximum number of Additional Shares of Common Stock issuable upon exercise or conversion thereof and to have received as consideration for the issuance of such shares an amount equal to the total amount of the consideration, if any, received by the Company for the issuance of such rights or options or Convertible Securities plus:

(A) in the case of such rights or options, the minimum amounts of consideration, if any, payable to the Company upon the exercise of such rights or options; and

(B) in the case of Convertible Securities, the minimum amounts of consideration, if any, payable to the Company upon the conversion thereof (other than by cancellation of liabilities or obligations evidenced by such Convertible Securities); *provided*, that if the minimum amounts of such consideration cannot be ascertained, but are a function of antidilution or similar protective clauses, the Company shall be deemed to have received the minimum amounts of consideration without reference to such clauses.

(C) If the minimum amount of consideration payable to the Company upon the exercise or conversion of rights, options or Convertible Securities is reduced over time or on the occurrence or non-occurrence of specified events other than by reason of antidilution adjustments, the Effective Price shall be recalculated using the figure to which such minimum amount of consideration is reduced; *provided further*, that if the minimum amount of consideration payable to the Company upon the exercise or conversion of such rights, options or Convertible Securities is subsequently increased, the Effective Price shall be again recalculated using the increased minimum amount of consideration payable to the Company upon the exercise or conversion of such rights, options or Convertible Securities.

(D) No further adjustment of the Series Preferred Conversion Price, as adjusted upon the issuance of such rights, options or Convertible Securities, shall be made as a result of the actual issuance of Additional Shares of Common Stock or the exercise of any such rights or options or the conversion of any such Convertible Securities. If any such rights or options or the conversion privilege represented by any such Convertible Securities shall expire without having been exercised, the Series Preferred Conversion Price as adjusted upon the issuance of such rights, options or Convertible Securities shall be readjusted to the Series Preferred Conversion Price that would have been in effect had an adjustment been made on the basis that the only Additional Shares of Common Stock so issued were the Additional Shares of Common Stock, if any, actually issued or sold on the exercise of such rights or options or rights of conversion of such Convertible Securities, and such Additional Shares of Common Stock, if any, were issued or sold for the consideration actually received by the Company upon such exercise, plus the consideration, if any, actually received by the Company for the granting of all such rights or options, whether or not exercised, plus the consideration received for issuing or selling the Convertible Securities actually converted, plus the consideration, if any, actually received by the Company (other than by cancellation of liabilities or obligations evidenced by such Convertible Securities) on the conversion of such Convertible Securities, *provided* that such readjustment shall not apply to prior conversions of Series Preferred.

(v) For the purpose of making any adjustment to the Series Preferred Conversion Price required under this Section 4(h), "***Additional Shares of Common Stock***" shall mean all shares of Common Stock issued by the Company or deemed to be issued pursuant to this Section 4(h) (including shares of Common Stock subsequently reacquired or retired by the Company), other than:

(A) shares of Common Stock issued upon conversion of the Series Preferred;

(B) shares of Common Stock or Convertible Securities issued after the Original Issue Date to employees, officers or directors of, or consultants or advisors to the Company or any subsidiary pursuant to stock purchase or stock option plans or other arrangements that are approved by the Board;

(C) shares of Common Stock issued pursuant to the exercise or conversion of Convertible Securities outstanding as of the Original Issue Date;

(D) shares of Common Stock or Convertible Securities issued for consideration other than cash pursuant to a merger, consolidation, acquisition, strategic alliance or similar business combination approved by the Board;

(E) shares of Common Stock or Convertible Securities issued pursuant to any equipment loan or leasing arrangement, real property leasing arrangement or debt financing from a bank or similar financial or lending institution approved by the Board;

(F) shares of Common Stock or Convertible Securities issued to third-party service providers in exchange for or as partial consideration for services rendered to the Company as approved by the Board;

(G) shares of Common Stock or Convertible Securities issued in connection with strategic transactions involving the Company and other entities approved by the Board, including without limitation joint ventures, manufacturing, marketing, distribution, technology transfer or development arrangements; and

(H) shares of Common Stock or Convertible Securities that the holders of a majority of the outstanding shares of Series Preferred elect in writing to exclude from the definition of Additional Shares of Common Stock for purposes of this Section 4.

References to Common Stock in the subsections of this clause (v) above shall mean all shares of Common Stock issued by the Company or deemed to be issued pursuant to this Section 4(h). The "***Effective Price***" of Additional Shares of Common Stock shall mean the quotient determined by dividing the total number of Additional Shares of Common Stock issued or sold, or deemed to have been issued or sold by the Company under this Section 4(h), into the Aggregate Consideration received, or deemed to have been received by the Company for such issue under this Section 4(h),

for such Additional Shares of Common Stock. In the event that the number of shares of Additional Shares of Common Stock or the Effective Price cannot be ascertained at the time of issuance, such Additional Shares of Common Stock shall be deemed issued immediately upon the occurrence of the first event that makes such number of shares or the Effective Price, as applicable, ascertainable.

(vi) In the event that the Company issues or sells, or is deemed to have issued or sold, Additional Shares of Common Stock in a Qualifying Dilutive Issuance (the "***First Dilutive Issuance***"), then in the event that the Company issues or sells, or is deemed to have issued or sold, Additional Shares of Common Stock in a Qualifying Dilutive Issuance other than the First Dilutive Issuance as a part of the same transaction or series of related transactions as the First Dilutive Issuance (a "***Subsequent Dilutive Issuance***"), then and in each such case upon a Subsequent Dilutive Issuance the Series Preferred Conversion Price shall be reduced to the Series Preferred Conversion Price that would have been in effect had the First Dilutive Issuance and each Subsequent Dilutive Issuance all occurred on the closing date of the First Dilutive Issuance.

(i) Certificate of Adjustment. In each case of an adjustment or readjustment of the Series Preferred Conversion Price for the number of shares of Common Stock or other securities issuable upon conversion of the Series Preferred, if the Series Preferred is then convertible pursuant to this Section 4, the Company, at its expense, shall compute such adjustment or readjustment in accordance with the provisions hereof and shall, upon request, prepare a certificate showing such adjustment or readjustment, and shall mail such certificate, by first class mail, postage prepaid, to each registered holder of Series Preferred so requesting at the holder's address as shown in the Company's books. The certificate shall set forth such adjustment or readjustment, showing in detail the facts upon which such adjustment or readjustment is based, including a statement of (i) the consideration received or deemed to be received by the Company for any Additional Shares of Common Stock issued or sold or deemed to have been issued or sold, (ii) the Series Preferred Conversion Price at the time in effect, (iii) the number of Additional Shares of Common Stock and (iv) the type and amount, if any, of other property that at the time would be received upon conversion of the Series Preferred. Failure to request or provide such notice shall have no effect on any such adjustment.

(j) Notices of Record Date. Upon (i) any taking by the Company of a record of the holders of any class of securities for the purpose of determining the holders thereof who are entitled to receive any dividend or other distribution, or (ii) any Acquisition (as defined in Section 3) or other capital reorganization of the Company, any reclassification or recapitalization of the capital stock of the Company, any merger or consolidation of the Company with or into any other corporation, or any Asset Transfer (as defined in Section 3), or any voluntary or involuntary dissolution, liquidation or winding up of the Company, the Company shall mail to each holder of Series Preferred at least ten (10) days prior to (x) the record date, if any, specified therein; or (y) if no record date is specified, the date upon which such action is to take effect (or, in either case, such shorter period as may be approved by the holders of a majority of the outstanding Series Preferred) a notice specifying (A) the date on which any such record is to be taken for the purpose of such dividend or distribution and a description of such dividend or distribution, (B) the date on which any such Acquisition, reorganization, reclassification, transfer, consolidation, merger, Asset Transfer, dissolution, liquidation or winding up is expected to become effective, and (C) the date, if any, that is to be fixed as to when the holders of record of Common Stock (or other securities) shall be entitled to exchange their shares of Common Stock (or other securities) for securities or other property deliverable upon such Acquisition, reorganization, reclassification, transfer, consolidation, merger, Asset Transfer, dissolution, liquidation or winding up.

(k) Automatic Conversion.

(i) Each share of Series Preferred shall automatically be converted into shares of Common Stock, based on the then-effective Series Preferred Conversion Price, (A) at any time upon the affirmative election of the holders of a majority of the outstanding shares of the Series Preferred, provided, however, that the Series C Preferred shall not be converted pursuant to this clause (A) without the affirmative election of the holders of a majority of the then outstanding shares of Series C Preferred, or (B) immediately upon the closing of a firm-commitment underwritten public offering pursuant to an effective registration statement under the Securities Act of 1933, as amended, covering the offer and sale of Common Stock for the account of the Company in which the gross cash proceeds to the Company (before underwriting discounts, commissions and fees) are at least $30,000,000 (a "***Qualified Public Offering***"). Upon such automatic conversion, any declared and unpaid dividends shall be paid in accordance with the provisions of Section 4(d).

(ii) Upon the occurrence of either of the events specified in Section 4(k)(i) above, the outstanding shares of Series Preferred shall be converted automatically without any further action by the holders of such shares and whether or not the certificates representing such shares are surrendered to the Company or its transfer agent; *provided, however*, that the Company shall not be obligated to issue certificates evidencing the shares of Common Stock issuable upon such conversion unless the certificates evidencing such shares of Series Preferred are either delivered to the Company or its transfer agent as provided below, or the holder notifies the Company or its transfer agent that such certificates have been lost, stolen or destroyed and executes an agreement satisfactory to the Company to indemnify the Company from any loss incurred by it in connection with such certificates. Upon the occurrence of such automatic conversion of the Series Preferred, the holders of Series Preferred shall surrender the certificates representing such shares at the office of the Company or any transfer agent for the Series Preferred. Thereupon, there shall be issued and delivered to such holder promptly at such office and in its name as shown on such surrendered certificate or certificates, a certificate or certificates for the number of shares of Common Stock into which the shares of Series Preferred surrendered were convertible on the date on which such automatic conversion occurred, and any declared and unpaid dividends shall be paid in accordance with the provisions of Section 4(d).

(l) Fractional Shares. No fractional shares of Common Stock shall be issued upon conversion of Series Preferred. All shares of Common Stock (including fractions thereof) issuable upon conversion of more than one share of Series Preferred by a holder thereof shall be aggregated for purposes of determining whether the conversion would result in the issuance of any fractional share. If after the aforementioned aggregation the conversion would result in the issuance of any fractional share, the Company shall, in lieu of issuing any fractional share, pay cash equal to the product of such fraction multiplied by the fair market value of one share of Common Stock (as determined in good faith by the Board) on the date of conversion.

(m) Reservation of Stock Issuable Upon Conversion. The Company shall at all times reserve and keep available out of its authorized but unissued shares of Common Stock, solely for the purpose of effecting the conversion of the shares of the Series Preferred, such number of its shares of Common Stock as shall from time to time be sufficient to effect the conversion of all outstanding shares of the Series Preferred. If at any time the number of authorized but unissued shares of Common Stock shall not be sufficient to effect the conversion of all then outstanding shares of the Series Preferred, the Company will take such corporate action as may be necessary to increase its authorized but unissued shares of Common Stock to such number of shares as shall be sufficient for such purpose.

(n) Notices. Any notice required by the provisions of this Section 4 shall be in writing and shall be deemed effectively given: (i) upon personal delivery to the party to be notified, (ii) when sent by electronic transmission in compliance with the provisions of the DGCL if sent during normal business hours of the recipient; if not, then on the next business day, (iii) five (5) days after having been sent by registered or certified mail, return receipt requested, postage prepaid or (iv) one (1) day after deposit with a nationally recognized overnight courier, specifying next day delivery, with verification of receipt. All notices shall be addressed to each holder of record at the address of such holder appearing on the books of the Company.

(o) Payment of Taxes. The Company will pay all taxes (other than taxes based upon income) and other governmental charges that may be imposed with respect to the issue or delivery of shares of Common Stock upon conversion of shares of Series Preferred, excluding any tax or other charge imposed in connection with any transfer involved in the issue and delivery of shares of Common Stock in a name other than that in which the shares of Series Preferred so converted were registered.

5. NO REISSUANCE OF SERIES PREFERRED.

Any shares or shares of Series Preferred redeemed, purchased, converted or exchanged by the Company shall be cancelled and retired and shall not be reissued or transferred.

V.

A. The liability of the directors of the Company for monetary damages shall be eliminated to the fullest extent under applicable law.

B. To the fullest extent permitted by applicable law, the Company is authorized to provide indemnification of (and advancement of expenses to) directors, officers and agents of the Company (and any other persons to which applicable law permits the Company to provide indemnification) through Bylaw provisions, agreements with such agents or other persons, vote of stockholders or disinterested directors or otherwise in excess of the indemnification and advancement otherwise permitted by Section 145 of the DGCL and, if applicable, Section 317 of the CGCL. If the DGCL or any other law of the State of Delaware is amended after approval by the stockholders of this Article V to authorize corporate action further eliminating or limiting the personal liability of directors, then the liability of a director to the Company shall be eliminated or limited to the fullest extent permitted by the DGCL as so amended.

C. Any repeal or modification of this Article V shall only be prospective and shall not affect the rights or protections or increase the liability of any director under this Article V in effect at the time of the alleged occurrence of any action or omission to act giving rise to liability.

VI.

For the management of the business and for the conduct of the affairs of the Company, and in further definition, limitation and regulation of the powers of the Company, of its directors and of its stockholders or any class thereof, as the case may be, it is further provided that:

A. The management of the business and the conduct of the affairs of the Company shall be vested in its Board. The number of directors that shall constitute the whole Board shall be fixed by the Board in the manner provided in the Bylaws, subject to any restrictions which may be set forth in this Restated Certificate.

B. The Board is expressly empowered to adopt, amend or repeal the Bylaws of the Company, subject to any restrictions that may be set forth in this Restated Certificate. The stockholders shall also have the power to adopt, amend or repeal the Bylaws of the Company, subject to any restrictions that may be set forth in this Restated Certificate.

C. The directors of the Company need not be elected by written ballot unless the Bylaws so provide.

VII.

The Company renounces, to the fullest extent permitted by law, any interest or expectancy of the Company in, or in being offered an opportunity to participate in, any Excluded Opportunity. An "***Excluded Opportunity***" is any matter, transaction or interest that is presented to, or acquired, created or developed by, or which otherwise comes into the possession of (i) any director of the Company who is not an employee of the Company or any of its subsidiaries, or (ii) any holder of Preferred Stock or any partner, member, director, stockholder, employee or agent of any such holder, other than someone who is an employee of the Company or any of its subsidiaries (collectively, "***Covered Persons***"), unless such matter, transaction or interest is presented to, or acquired, created or developed by, or otherwise comes into the possession of, a Covered Person expressly and solely in such Covered Person's capacity as a director of the Company.

* * * *

FOUR: This Restated Certificate has been duly approved by the Board of the Company.

FIVE: This Restated Certificate was approved by the holders of the requisite number of shares of said corporation in accordance with Section 228 of the DGCL. This Restated Certificate has been duly adopted in accordance with the provisions of Sections 242 and 245 of the DGCL by the stockholders of the Company.

[THIS SPACE INTENTIONALLY LEFT BLANK]

IN WITNESS WHEREOF, Personalis, Inc. has caused this Amended and Restated Certificate of Incorporation to be signed by its President and Chief Executive Officer this 15th day of December, 2014.

PERSONALIS, INC.

Signature: /s/ John West

John West, President and Chief Executive Officer

CERTIFICATE OF AMENDMENT
OF
AMENDED AND RESTATED CERTIFICATE OF INCORPORATION
OF
PERSONALIS, INC.

The undersigned, John West, hereby certifies that:

1. He is the duly elected President and Chief Executive Officer of Personalis, Inc., a Delaware corporation.

2. The Certificate of Incorporation of this corporation was originally filed with the Secretary of State of Delaware on February 21, 2011.

3. Pursuant to Section 242 of the General Corporation Law of the State of Delaware, this Certificate of Amendment of Amended and Restated Certificate of Incorporation amends this corporation's Certificate of Incorporation as follows:

(a) The Section 2(d)(i) of Article IV(D) is amended and restated to read in its entirety as follows:

"(i) There shall initially be seven members of the Board."

4. The foregoing Certificate of Amendment of Amended and Restated Certificate of Incorporation has been duly adopted by this corporation's Board of Directors and stockholders in accordance with the applicable provisions of Sections 228 and 242 of the General Corporation Law of the State of Delaware.

[Signature Page Follows]

Executed at Menlo Park, California, on June 29, 2015.

/s/ John West

John West, President and Chief Executive Officer

SECOND CERTIFICATE OF AMENDMENT OF
AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
PERSONALIS, INC.

PERSONALIS, INC., a corporation organized and existing under and by virtue of the provisions of the Delaware General Corporation Law (such corporation, the "***Company***," and such law, the "***DGCL***"), hereby certifies that:

FIRST: The name of this corporation is **PERSONALIS, INC.**

SECOND: The date on which the Certificate of Incorporation of the Company was originally filed with the Secretary of State of the State of Delaware was February 21, 2011.

THIRD: The Board of Directors of the Company (the "***Board***"), acting in accordance with Section 141 and Section 242 of the DGCL, adopted resolutions amending the Certificate of Incorporation of the Company as follows:

1. Paragraph A of Article IV shall be amended and restated to read in its entirety as follows:

   "A. The Company is authorized to issue two classes of stock to be designated, respectively, Common Stock and Preferred Stock. The total number of shares that the Company is authorized to issue is 177,938,150 shares, 102,700,000 shares of which shall be Common Stock and 75,238,150 shares of which shall be Preferred Stock (the "***Preferred Stock***"). The Preferred Stock shall have a par value of $0.0001 per share and the Common Stock shall have a par value of $0.0001 per share."

2. Paragraph C of Article IV shall be amended and restated to read in its entirety as follows:

   "C. 31,250,000 of the authorized shares of Preferred Stock are hereby designated "Series A Convertible Preferred Stock" (the "***Series A Preferred***"), 19,288,150 of the authorized shares of Preferred Stock are hereby designated "Series B Convertible Preferred Stock" (the "***Series B Preferred***,") and 24,700,000 shares are designated "Series C Convertible Preferred Stock" (the "***Series C Preferred***", together with the Series A Preferred and the Series B Preferred, the "Series Preferred").

3. Section 2(c) of Paragraph D of Article IV shall be amended and restated to read in its entirety as follows:

   "(c) **Separate Vote of Series C Preferred**. For so long as at least 1,000,000 shares of Series C Preferred (as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares after the filing date hereof) remain outstanding, in addition to any other vote or consent required herein or by law, the vote or written consent of the holders of at least sixty percent (60%) of the outstanding Series C Preferred shall be necessary for effecting or validating (whether by merger, recapitalization or otherwise) (i) any amendment, alteration or repeal of any provision of the Certificate of Incorporation or Bylaws of the Company (including any filing of a Certificate of Designation) that alters or changes the voting or other powers, preferences or other special rights, privileges or restrictions of the Series C Preferred in a manner that adversely affects the interests or rights of the holders of Series C Preferred in a different and disproportionate manner than the other series of Preferred Stock or (ii) any amendment of Section D.4(k)(i)(A) of this Article IV."

FOURTH: Thereafter pursuant to a resolution of the Board, this Second Certificate of Amendment was submitted to the stockholders of the Company for their approval, and was duly adopted in accordance with Section 228 and Section 242 of the DGCL.

IN WITNESS WHEREOF, the Company has caused this Second Certificate of Amendment to be signed by its President and Chief Executive Officer this 11th day of September, 2018.

PERSONALIS, INC.

By: /s/ John West

John West
President and Chief Executive Officer

THIRD CERTIFICATE OF AMENDMENT OF
AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
PERSONALIS, INC.

PERSONALIS, INC., a corporation organized and existing under and by virtue of the provisions of the Delaware General Corporation Law (such corporation, the "***Company***," and such law, the "***DGCL***"), hereby certifies that:

FIRST: The name of this corporation is **PERSONALIS, INC.**

SECOND: The date on which the Certificate of Incorporation of the Company was originally filed with the Secretary of State of the State of Delaware was February 21, 2011.

THIRD: The Board of Directors of the Company (the "***Board***"), acting in accordance with Section 141 and Section 242 of the DGCL, adopted resolutions amending the Certificate of Incorporation of the Company as follows:

1. Paragraph A of Article IV shall be amended and restated to read in its entirety as follows:

"A. The Company is authorized to issue two classes of stock to be designated, respectively, Common Stock and Preferred Stock. The total number of shares that the Company is authorized to issue is 183,938,150 shares, 105,700,000 shares of which shall be Common Stock and 78,238,150 shares of which shall be Preferred Stock (the "***Preferred Stock***"). The Preferred Stock shall have a par value of $0.0001 per share and the Common Stock shall have a par value of $0.0001 per share."

FOURTH: Thereafter pursuant to a resolution of the Board, this Third Certificate of Amendment was submitted to the stockholders of the Company for their approval, and was duly adopted in accordance with Section 228 and Section 242 of the DGCL.

IN WITNESS WHEREOF, the Company has caused this Third Certificate of Amendment to be signed by its President and Chief Executive Officer this 31st day of December 2018.

PERSONALIS, INC.

By: /s/ John West

John West
President and Chief Executive Officer

FOURTH CERTIFICATE OF AMENDMENT OF AMENDED AND RESTATED CERTIFICATE OF INCORPORATION OF PERSONALIS, INC.

PERSONALIS, INC., a corporation organized and existing under and by virtue of the provisions of the Delaware General Corporation Law (such corporation, the "***Company***," and such law, the "***DGCL***"), hereby certifies that:

FIRST: The name of this corporation is **PERSONALIS, INC**.

SECOND: The date on which the Certificate of Incorporation of the Company was originally filed with the Secretary of State of the State of Delaware was February 21, 2011.

THIRD: The Board of Directors of the Company (the "***Board***"), acting in accordance with Section 141 and Section 242 of the DGCL, adopted resolutions amending the Certificate of Incorporation of the Company as follows:

1. Paragraph A of Article IV is amended and restated to read in its entirety as follows:

   "A. The Company is authorized to issue two classes of stock to be designated, respectively, Common Stock and Preferred Stock. The total number of shares that the Company is authorized to issue is 188,238,150 shares, 110,000,000 shares of which shall be Common Stock and 78,238,150 shares of which shall be Preferred Stock (the "***Preferred Stock***"). The Preferred Stock shall have a par value of $0.0001 per share and the Common Stock shall have a par value of $0.0001 per share."

2. Section 2(b)(vii) of Article IV(D) is amended and restated to read in its entirety as follows:

   "(vii) Any increase in the authorized number of members of the Company's Board that would set such authorized number higher than ten."

3. Section 2(d)(i) of Article IV(D) is amended and restated to read in its entirety as follows:

   "(i) The number of directors which shall constitute the Board shall be fixed exclusively by resolutions adopted by a majority of the authorized number of directors constituting the Board, but shall not exceed ten."

FOURTH: Thereafter pursuant to a resolution of the Board, this Fourth Certificate of Amendment was submitted to the stockholders of the Company for their approval, and was duly adopted in accordance with Section 228 and Section 242 of the DGCL.

IN WITNESS WHEREOF, the Company has caused this Fourth Certificate of Amendment to be signed by its President and Chief Executive Officer this 21st day of May, 2019.

PERSONALIS, INC.

By: /s/ John West
John West
President and Chief Executive Officer

FIFTH CERTIFICATE OF AMENDMENT OF
AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
PERSONALIS, INC.

PERSONALIS, INC., a corporation organized and existing under and by virtue of the provisions of the Delaware General Corporation Law (such corporation, the "***Company***," and such law, the "***DGCL***"), hereby certifies that:

FIRST: The name of this corporation is **PERSONALIS, INC.**

SECOND: The date on which the Certificate of Incorporation of the Company was originally filed with the Secretary of State of the State of Delaware was February 21, 2011.

THIRD: The Board of Directors of the Company (the "***Board***"), acting in accordance with Section 141 and Section 242 of the DGCL, adopted resolutions amending the Certificate of Incorporation of the Company as follows:

1. Paragraph A of Article IV is amended and restated to read in its entirety as follows:

"A. The Company is authorized to issue two classes of stock to be designated, respectively, Common Stock and Preferred Stock. The total number of shares that the Company is authorized to issue is 188,238,150 shares, 110,000,000 shares of which shall be Common Stock (the "***Common Stock***") and 78,238,150 shares of which shall be Preferred Stock (the "***Preferred Stock***"). The Preferred Stock shall have a par value of $0.0001 per share and the Common Stock shall have a par value of $0.0001 per share. Effective upon the filing of this Fifth Certificate of Amendment to the Amended and Restated Certificate of Incorporation with the Secretary of State of the State of Delaware (the "***Effective Time***"), every four (4) shares of Common Stock then issued and outstanding or held in the treasury of the Company immediately prior to the Effective Time shall automatically be combined into one (1) share of Common Stock, without any further action by the holders of such shares and every four (4) shares of Preferred Stock then issued and outstanding or held in the treasury of the Company immediately prior to the Effective Time shall automatically be combined into one (1) share of such same series of Preferred Stock, without any further action by the holders of such shares (the "***Reverse Stock Split***"). The Reverse Stock Split will be effected on a holder-by-holder basis, and any fractional shares resulting from such combination shall be rounded down to the nearest whole share on a holder-by-holder basis. No fractional shares shall be issued in connection with the Reverse Stock Split. In lieu of any fractional shares to which a holder would otherwise be entitled, the Company shall pay cash equal to such fraction multiplied by the fair market value of a share of Common Stock as determined in good faith by the Company's Board of Directors. The Reverse Stock Split shall occur automatically without any further action by the holders of the shares of Common Stock and Preferred Stock affected thereby. All rights, preferences and privileges of the Common Stock and the Preferred Stock shall be appropriately adjusted to reflect the Reverse Stock Split in accordance with the Amended and Restated Certificate of Incorporation, as amended by this Fifth Certificate of Amendment."

FOURTH: Thereafter pursuant to a resolution of the Board, this Fifth Certificate of Amendment was submitted to the stockholders of the Company for their approval, and was duly adopted in accordance with Section 228 and Section 242 of the DGCL.

IN WITNESS WHEREOF, the Company has caused this Fifth Certificate of Amendment to be signed by its President and Chief Executive Officer this 4th day of June, 2019.

PERSONALIS, INC.

By: /s/ John West
John West
President and Chief Executive Officer

AMENDED AND RESTATED CERTIFICATE OF INCORPORATION OF PERSONALIS, INC.

The undersigned, John West, hereby certifies that:

ONE: The original name of this corporation is Personalis, Inc. and the date of filing the original Certificate of Incorporation of this corporation with the Secretary of State of the State of Delaware was February 21, 2011.

TWO: He is the duly elected and acting President and Chief Executive Officer of Personalis, Inc., a Delaware corporation.

THREE: The Amended and Restated Certificate of Incorporation, as amended, of this corporation is hereby amended and restated to read as follows:

I.

The name of this corporation is **PERSONALIS, INC.** (the "***Company***").

II.

The address of the registered office of this Company in the State of Delaware is 3500 South DuPont Highway, City of Dover, County of Kent 19901, and the name of the registered agent of this corporation in the State of Delaware at such address is Incorporating Services, Ltd.

III.

The purpose of the Company is to engage in any lawful act or activity for which a corporation may be organized under the Delaware General Corporation Law ("***DGCL***").

IV.

A. This Company is authorized to issue two classes of stock to be designated, respectively, "***Common Stock***" and "***Preferred Stock***." The total number of shares which the Company is authorized to issue is two hundred ten million (210,000,000) shares. Two hundred million (200,000,000) shares shall be Common Stock, having a par value per share of $0.0001. Ten million (10,000,000) shares shall be Preferred Stock, having a par value per share of $0.0001.

B. The Preferred Stock may be issued from time to time in one or more series. The Board of Directors of the Company (the "***Board of Directors***") is hereby expressly authorized to provide for the issue of all or any of the shares of the Preferred Stock in one or more series, and to fix the number of shares and to determine or alter for each such series, such voting powers, full or limited, or no voting powers, and such designation, preferences, and relative, participating, optional, or other rights and such qualifications, limitations, or restrictions thereof, as shall be stated and expressed in the resolution or resolutions adopted by the Board of Directors providing for the issuance of such shares and as may be permitted by the DGCL. The Board of Directors is also expressly authorized to increase or decrease the number of shares of any series subsequent to the issuance of shares of that series, but not below the number of shares of such series then outstanding. In case the number of shares of any series shall be decreased in accordance with the foregoing sentence, the shares constituting such decrease shall resume the status that they had prior to the adoption of the resolution originally fixing the number of shares of such series. The number of authorized shares of Preferred Stock may be increased or decreased (but not below the number of shares thereof then outstanding) by the affirmative vote of the holders of a majority of the voting power of the stock of the Company entitled to vote thereon, without a separate vote of the holders of the Preferred Stock, or of any series thereof, unless a vote of any such holders is required pursuant to the terms of any certificate of designation filed with respect to any series of Preferred Stock.

C. Each outstanding share of Common Stock shall entitle the holder thereof to one vote on each matter properly submitted to the stockholders of the Company for their vote; provided, however, that, except as otherwise required by law, holders of Common Stock shall not be entitled to vote on any amendment to this Amended and Restated Certificate of Incorporation (including any certificate of designation filed with respect to any series of Preferred Stock) that relates solely to the terms of one or more outstanding series of Preferred Stock if the holders of such affected series are entitled, either separately or together as a class with the holders of one or more other such series, to vote thereon by law or pursuant to this Amended and Restated Certificate of Incorporation (including any certificate of designation filed with respect to any series of Preferred Stock).

V.

For the management of the business and for the conduct of the affairs of the Company, and in further definition, limitation and regulation of the powers of the Company, of its directors and of its stockholders or any class thereof, as the case may be, it is further provided that:

A. MANAGEMENT OF BUSINESS. The management of the business and the conduct of the affairs of the Company shall be vested in its Board of Directors. The number of directors which shall constitute the Board of Directors shall be fixed exclusively by resolutions adopted by a majority of the authorized number of directors constituting the Board of Directors.

B. BOARD OF DIRECTORS. Subject to the rights of the holders of any series of Preferred Stock to elect additional directors under specified circumstances, upon the filing of this Amended and Restated Certificate of Incorporation, the directors shall be divided into three classes designated as Class I, Class II and Class III, respectively. The Board of Directors is authorized to assign members of the Board of Directors already in office to such classes at the time the classification becomes effective. At the first annual meeting of stockholders following the initial classification of the Board of Directors, the term of office of the Class I directors shall expire and Class I directors shall be elected for a full term of three years. At the second annual meeting of stockholders following such initial classification, the term of office of the Class II directors shall expire and Class II directors shall be elected for a full term of three years. At the third annual meeting of stockholders following such initial classification, the term of office of the Class III directors shall expire and Class III directors shall be elected for a full term of three years. At each succeeding annual meeting of stockholders, directors shall be elected for a full term of three 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. No decrease in the number of directors constituting the Board of Directors shall shorten the term of any incumbent director.

C. REMOVAL OF DIRECTORS.

1. Subject to the rights of any series of Preferred Stock to elect additional directors under specified circumstances, neither the Board of Directors nor any individual director may be removed without cause.

2. Subject to any limitation imposed by applicable law, any individual director or directors may be removed with cause by the affirmative vote of the holders of at least sixty-six and two-thirds percent (66 2/3%) of the voting power of all then-outstanding shares of capital stock of the Company entitled to vote generally at an election of directors.

D. VACANCIES. Subject to any limitations imposed by applicable law and subject to the rights of the holders of any series of Preferred Stock, any vacancies on the Board of Directors resulting from death, resignation, disqualification, removal or other causes and any newly created directorships resulting from any increase in the number of directors, shall, unless the Board of Directors determines by resolution that any such vacancies or newly created directorships shall be filled by the stockholders and except as otherwise provided by applicable law, be filled only by the affirmative vote of a majority of the directors then in office, even though less than a quorum of the Board of Directors, and not by the stockholders. Any director elected in accordance with the preceding sentence shall hold office for the remainder of the full term of the director for which the vacancy was created or occurred and until such director’s successor shall have been elected and qualified.

E. BYLAW AMENDMENTS.

1. The Board of Directors is expressly empowered to adopt, amend or repeal the Bylaws of the Company. Any adoption, amendment or repeal of the Bylaws of the Company by the Board of Directors shall require the approval of a majority of the authorized number of directors. The stockholders shall also have power to adopt, amend or repeal the Bylaws of the Company; provided, however, that, in addition to any vote of the holders of any class or series of stock of the Company required by law or by this Amended and Restated Certificate of Incorporation, such action by stockholders shall require the affirmative vote of the holders of at least sixty-six and two-thirds percent (66 2/3%) of the voting power of all of the then-outstanding shares of the capital stock of the Company entitled to vote generally in the election of directors, voting together as a single class.

2. The directors of the Company need not be elected by written ballot unless the Bylaws so provide.

3. No action shall be taken by the stockholders of the Company except at an annual or special meeting of stockholders called in accordance with the Bylaws, and no action shall be taken by the stockholders by written consent or electronic transmission.

4. Advance notice of stockholder nominations for the election of directors and of business to be brought by stockholders before any meeting of the stockholders of the Company shall be given in the manner provided in the Bylaws of the Company.

VI.

A. The liability of the directors for monetary damages shall be eliminated to the fullest extent under applicable law.

B. To the fullest extent permitted by applicable law, the Company is authorized to provide indemnification of (and advancement of expenses to) directors, officers and agents of the Company (and any other persons to which applicable law permits the Company to provide indemnification) through Bylaw provisions, agreements with such agents or other persons, vote of stockholders or disinterested directors or otherwise in excess of the indemnification and advancement otherwise permitted by such applicable law. If applicable law is amended after approval by the stockholders of this Article VI to authorize corporate action further eliminating or limiting the personal liability of directors, then the liability of a director to the Company shall be eliminated or limited to the fullest extent permitted by applicable law as so amended.

C. Any repeal or modification of this Article VI shall only be prospective and shall not affect the rights or protections or increase the liability of any director under this Article VI in effect at the time of the alleged occurrence of any act or omission to act giving rise to liability or indemnification.

VII.

Unless the Company consents in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware (or, if and only if the Court of Chancery of the State of Delaware lacks subject matter jurisdiction, any state court located within the State of Delaware or, if and only if all such state courts lack subject matter jurisdiction, the federal district court for the District of Delaware) shall be the sole and exclusive forum for the following types of actions or proceedings under Delaware statutory or common law: (A) any derivative action or proceeding brought on behalf of the Company; (B) any action asserting a claim of breach of a fiduciary duty owed by any director, officer or other employee of the Company to the Company or the Company's stockholders; (C) any action asserting a claim against the Company or any director or officer or other employee of the Company arising pursuant to any provision of the DGCL, this Amended and Restated Certificate of Incorporation or the Bylaws of the Company; or (D) any action asserting a claim against the Company or any director or officer or other employee of the Company governed by the internal affairs doctrine. This Article VII shall not apply to suits brought to enforce a duty or liability created by the Securities Exchange Act of 1934 or any other claim for which the federal courts have exclusive jurisdiction.

Unless the Company 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 and contingent upon a final adjudication in the State of Delaware of the enforceability of such exclusive forum provision.

Any person or entity purchasing or otherwise acquiring any interest in shares of capital stock of the Company shall be deemed to have notice of and to have consented to the provisions of this Article VII.

VIII.

A. The Company reserves the right to amend, alter, change or repeal any provision contained in this Amended and Restated Certificate of Incorporation, in the manner now or hereafter prescribed by statute, except as provided in paragraph B. of this Article VIII, and all rights conferred upon the stockholders herein are granted subject to this reservation.

B. Notwithstanding any other provisions of this Amended and Restated Certificate of Incorporation or any provision of applicable law which might otherwise permit a lesser vote or no vote, but in addition to any affirmative vote of the holders of any particular class or series of the capital stock of the Company required by law or by this Amended and Restated Certificate of Incorporation or any certificate of designation filed with respect to a series of Preferred Stock, the affirmative vote of the holders of at least sixty-six and two-thirds percent (66 2/3%) of the voting power of all of the then outstanding shares of capital stock of the Company entitled to vote generally in the election of directors, voting together as a single class, shall be required to alter, amend or repeal Articles V, VI, VII and VIII.

* * * *

FOUR: This Amended and Restated Certificate of Incorporation has been duly approved by the Board of Directors of the Company.

FIVE: This Amended and Restated Certificate of Incorporation was approved by the holders of the requisite number of shares of the Company in accordance with Section 228 of the DGCL. This Amended and Restated Certificate of Incorporation has been duly adopted in accordance with the provisions of Sections 242 and 245 of the DGCL by the stockholders of the Company.

IN WITNESS WHEREOF, Personalis, Inc. has caused this **AMENDED AND RESTATED CERTIFICATE OF INCORPORATION** to be signed by its President and Chief Executive Officer this day of , 2019.

PERSONALIS, INC.

By: _____
Name: John West
Title: President and Chief Executive Officer

Exhibit 3.4

AMENDED AND RESTATED BYLAWS

OF

PERSONALIS, INC.
(A DELAWARE CORPORATION)

_____, 2019

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(continued)

AMENDED AND RESTATED BYLAWS

OF

PERSONALIS, INC.
(A DELAWARE CORPORATION)

_____, 2019

ARTICLE I

OFFICES

Section 1. Registered Office. The registered office of Personalis, Inc. (the "***Corporation***") in the State of Delaware shall be 3500 South DuPont Highway, City of Dover, County of Kent, 19901.

Section 2. Other Offices. The Corporation shall also have and maintain an office or principal place of business at such place as may be fixed by the board of directors of the Corporation (the "***Board of Directors***"), and may also have offices at such other places, both within and without the State of Delaware, as the Board of Directors may from time to time determine or the business of the Corporation may require.

ARTICLE II

CORPORATE SEAL

Section 3. Corporate Seal. The Board of Directors may adopt a corporate seal. If adopted, the corporate seal shall consist of a die bearing the name of the Corporation and the inscription, "Corporate Seal-Delaware." Said seal may be used by causing it or a facsimile thereof to be impressed or affixed or reproduced or otherwise.

ARTICLE III

STOCKHOLDERS' MEETINGS

Section 4. Place of Meetings. Meetings of the stockholders of the Corporation may be held at such place, either within or without the State of Delaware, as may be determined from time to time by the Board of Directors. The Board of Directors may, in its sole discretion, determine that the meeting shall not be held at any place, but may instead be held solely by means of remote communication as provided under the Delaware General Corporation Law ("***DGCL***").

Section 5. Annual Meetings.

(a) The annual meeting of the stockholders of the Corporation, for the purpose of election of directors and for such other business as may properly come before it, shall be held on such date and at such time as may be designated from time to time by the Board of Directors. Nominations of persons for election to the Board of Directors of the Corporation and the proposal of business to be considered by the stockholders may be made at an annual meeting of stockholders: (i) pursuant to the Corporation's notice of meeting of stockholders (with respect to business other than nominations); (ii) brought specifically by or at the direction of the Board of Directors; or (iii) by any stockholder of the Corporation who was a stockholder of record at the time of giving the stockholder's notice provided for in Section 5(b) below, who is entitled to vote at the meeting and who complied with the notice procedures set forth in Section 5. For the avoidance of doubt, clause (iii) above shall be the exclusive means for a stockholder to make nominations and submit other business (other than matters properly included in the Corporation's notice of meeting of stockholders and proxy statement under Rule 14a-8 under the Securities Exchange Act of 1934, as amended, and the rules and regulations thereunder (the "***1934 Act***")) before an annual meeting of stockholders.

(b) At an annual meeting of the stockholders, only such business shall be conducted as is a proper matter for stockholder action under Delaware law and as shall have been properly brought before the meeting.

(i) For nominations for the election to the Board of Directors to be properly brought before an annual meeting by a stockholder pursuant to clause (iii) of Section 5(a) of these Amended and Restated Bylaws (these "***Bylaws***"), the stockholder must deliver written notice to the Secretary of the Corporation at the principal executive offices of the Corporation on a timely basis as set forth in Section 5(b)(iii) and must update and supplement such written notice on a timely basis as set forth in Section 5(c). Such stockholder's notice shall set forth: (A) as to each nominee such stockholder proposes to nominate at the meeting: (1) the name, age, business address and residence address of such nominee; (2) the principal occupation or employment of such nominee; (3) the class and number of shares of each class of capital stock of the Corporation which are owned of record and beneficially by such nominee; (4) the date or dates on which such shares were acquired and the investment intent of such acquisition; (5) a statement whether such nominee, if elected, intends to tender, promptly following such person's failure to receive the required vote for election or re-election at the next meeting at which such person would face election or re-election, an irrevocable resignation effective upon acceptance of such resignation by the Board of Directors; and (6) such other information concerning such nominee as would be required to be disclosed in a proxy statement soliciting proxies for the election of such nominee as a director in an election contest (even if an election contest is not involved), or that is otherwise required to be disclosed pursuant to Section 14 of the 1934 Act and the rules and regulations promulgated thereunder (including such person's written consent to being named as a nominee and to serving as a director if elected); and (B) the information required by Section 5(b)(iv). The Corporation may require any proposed nominee to furnish such other information as it may reasonably require to determine the eligibility of such proposed nominee to serve as an independent director of the Corporation or that could be material to a reasonable stockholder's understanding of the independence, or lack thereof, of such proposed nominee.

(ii) Other than proposals sought to be included in the Corporation's proxy materials pursuant to Rule 14a-8 under the 1934 Act, for business other than nominations for the election to the Board of Directors to be properly brought before an annual meeting by a stockholder pursuant to clause (iii) of Section 5(a) of these Bylaws, the stockholder must deliver written notice to the Secretary of the Corporation at the principal executive offices of the Corporation on a timely basis as set forth in Section 5(b)(iii), and must update and supplement such written notice on a timely basis as set forth in Section 5(c). Such stockholder's notice shall set forth: (A) as to each matter such stockholder proposes to bring before the meeting, a brief description of the business desired to be brought before the meeting, the reasons for conducting such business at the meeting, and any material interest (including any anticipated benefit of such business to any Proponent (as defined below) other than solely as a result of its ownership of the Corporation's capital stock, that is material to any Proponent individually, or to the Proponents in the aggregate) in such business of any Proponent; and (B) the information required by Section 5(b)(iv).

(iii) To be timely, the written notice required by Section 5(b)(i) or 5(b)(ii) must be received by the Secretary of the Corporation at the principal executive offices of the Corporation not later than the close of business on the ninetieth (90th) day nor earlier than the close of business on the one hundred twentieth (120th) day prior to the first anniversary of the preceding year's annual meeting; *provided, however,* that, subject to the last sentence of this Section 5(b)(iii), in the event that no annual meeting was held during the preceding year or the date of the annual meeting is advanced more than thirty (30) days prior to or delayed by more than thirty (30) days after the anniversary of the preceding year's annual meeting, notice by the stockholder to be timely must be so received not earlier than the close of business on the one hundred twentieth (120th) day prior to such annual meeting and not later than the close of business on the later of the ninetieth (90th) day prior to such annual meeting or the closing of business on the tenth (10th) day following the day on which public announcement of the date of such meeting is first made. In no event shall an adjournment or a postponement of an annual meeting for which notice has been given, or the public announcement thereof has been made, commence a new time period (or extend any time period) for the giving of a stockholder's notice as described above.

(iv) The written notice required by Section 5(b)(i) or 5(b)(ii) shall also set forth, as of the date of the notice and as to the stockholder giving the notice and the beneficial owner, if any, on whose behalf the nomination or proposal is made (each, a "***Proponent***" and collectively, the "***Proponents***"): (A) the name and address of each Proponent, as they appear on the Corporation's books; (B) the class, series and number of shares of the Corporation that are owned beneficially and of record by each Proponent; (C) a description of any agreement, arrangement or understanding (whether oral or in writing) with respect to such nomination or proposal between or among any Proponent and any of its affiliates or associates, and any others (including their names) acting in concert, or otherwise under the agreement, arrangement or understanding, with any of the foregoing; (D) a representation that the Proponents are holders of record or beneficial owners, as the case may be, of shares of the Corporation entitled to vote at the meeting and intend to appear in person or by proxy duly authorized at the meeting to nominate the person or persons specified in the notice (with respect to a notice under Section 5(b)(i)) or to propose the business that is specified in the notice (with respect to a notice under Section 5(b)(ii)); (E) a representation as to whether the Proponents intend to deliver a proxy

statement and form of proxy to holders of a sufficient number of holders of the Corporation's voting shares to elect such nominee or nominees (with respect to a notice under Section 5(b)(i)) or to carry such proposal (with respect to a notice under Section 5(b)(ii)); (F) to the extent known by any Proponent, the name and address of any other stockholder supporting the proposal on the date of such stockholder's notice; and (G) a description of all Derivative Transactions (as defined below) by each Proponent during the previous twelve (12) month period, including the date of the transactions and the class, series and number of securities involved in, and the material economic terms of, such Derivative Transactions.

(c) A stockholder providing written notice required by Section 5(b)(i) or (ii) shall update and supplement such notice in writing, if necessary, so that the information provided or required to be provided in such notice is true and correct in all material respects as of (i) the record date for the meeting and (ii) the date that is five (5) business days prior to the meeting and, in the event of any adjournment or postponement thereof, five (5) business days prior to such adjourned or postponed meeting. In the case of an update and supplement pursuant to clause (i) of this Section 5(c), such update and supplement shall be received by the Secretary of the Corporation at the principal executive offices of the Corporation not later than five (5) business days after the record date for the meeting. In the case of an update and supplement pursuant to clause (ii) of this Section 5(c), such update and supplement shall be received by the Secretary of the Corporation at the principal executive offices of the Corporation not later than two (2) business days prior to the date for the meeting, and, in the event of any adjournment or postponement thereof, two (2) business days prior to such adjourned or postponed meeting.

(d) Notwithstanding anything in Section 5(b)(iii) to the contrary, in the event that the number of directors in an Expiring Class (as defined below) is increased and there is no public announcement of the appointment of a director to such class, or, if no appointment was made, of the vacancy in such class, made by the Corporation at least ten (10) days before the last day a stockholder may deliver a notice of nomination in accordance with Section 5(b)(iii), a stockholder's notice required by this Section 5 and which complies with the requirements in Section 5(b)(i), other than the timing requirements in Section 5(b)(iii), shall also be considered timely, but only with respect to nominees for any new positions in such Expiring Class created by such increase, if it shall be received by the Secretary of the Corporation 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. For purposes of this section, an "***Expiring Class***" shall mean a class of directors whose term shall expire at the next annual meeting of stockholders.

(e) A person shall not be eligible for election or re-election as a director unless the person is nominated either in accordance with clause (ii) of Section 5(a), or in accordance with clause (iii) of Section 5(a). Except as otherwise required by law, the chairperson of the meeting shall have the power and duty to determine whether a nomination or any business proposed to be brought before the meeting was made, or proposed, as the case may be, in accordance with the procedures set forth in these Bylaws and, if any proposed nomination or business is not in compliance with these Bylaws, or the Proponent does not act in accordance with the representations in Sections 5(b)(iv)(D) and 5(b)(iv)(E), to declare that such proposal or nomination shall not be presented for stockholder action at the meeting and shall be disregarded, notwithstanding that proxies in respect of such nominations or such business may have been solicited or received.

(f) Notwithstanding the foregoing provisions of this Section 5, in order to include information with respect to a stockholder proposal in the proxy statement and form of proxy for a stockholders' meeting, a stockholder must also comply with all applicable requirements of the 1934 Act and the rules and regulations thereunder. Nothing in these Bylaws shall be deemed to affect any rights of stockholders to request inclusion of proposals in the Corporation's proxy statement pursuant to Rule 14a-8 under the 1934 Act; *provided*, *however*, that any references in these Bylaws to the 1934 Act or the rules and regulations thereunder are not intended to and shall not limit the requirements applicable to proposals and/or nominations to be considered pursuant to Section 5(a)(iii) of these Bylaws.

(g) For purposes of Sections 5 and 6,

(i) "***affiliates***" and "***associates***" shall have the meanings set forth in Rule 405 under the Securities Act of 1933, as amended (the "***1933 Act***");

(ii) "***Derivative Transaction***" means any agreement, arrangement, interest or understanding entered into by, or on behalf or for the benefit of, any Proponent or any of its affiliates or associates, whether record or beneficial:

(w) the value of which is derived in whole or in part from the value of any class or series of shares or other securities of the Corporation,

(x) which otherwise provides any direct or indirect opportunity to gain or share in any gain derived from a change in the value of securities of the Corporation,

(y) the effect or intent of which is to mitigate loss, manage risk or benefit of security value or price changes, or

(z) which provides the right to vote or increase or decrease the voting power of, such Proponent, or any of its affiliates or associates, with respect to any securities of the Corporation,

which agreement, arrangement, interest or understanding may include, without limitation, any option, warrant, debt position, note, bond, convertible security, swap, stock appreciation right, short position, profit interest, hedge, right to dividends, voting agreement, performance-related fee or arrangement to borrow or lend shares (whether or not subject to payment, settlement, exercise or conversion in any such class or series), and any proportionate interest of such Proponent in the securities of the Corporation held by any general or limited partnership, or any limited liability company, of which such Proponent is, directly or indirectly, a general partner or managing member: and

(iii) "***public announcement***" shall mean disclosure in a press release reported by the Dow Jones News Service, Associated Press, Business Wire, GlobeNewswire or comparable national news service or in a document publicly filed by the Corporation with the Securities and Exchange Commission pursuant to Section 13, 14 or 15(d) of the 1934 Act.

Section 6. Special Meetings.

(a) Special meetings of the stockholders of the Corporation may be called, for any purpose as is a proper matter for stockholder action under Delaware law, by (i) the Chairperson of the Board of Directors, (ii) the Chief Executive Officer or the President if the Chairperson of the Board of Directors is unavailable, or (iii) the Board of Directors pursuant to a resolution adopted by a majority of the total number of authorized directors (whether or not there exist any vacancies in previously authorized directorships at the time any such resolution is presented to the Board of Directors for adoption).

(b) For a special meeting of the stockholders of the Corporation called pursuant to Section 6(a), the Board of Directors shall determine the time and place, if any, of such special meeting. Upon determination of the time and place, if any, of the meeting, the Secretary of the Corporation shall cause a notice of meeting to be given to the stockholders entitled to vote, in accordance with the provisions of Section 7 of these Bylaws. No business may be transacted at such special meeting other than as specified in the notice of meeting.

(c) Nominations of persons for election to the Board of Directors may be made at a special meeting of stockholders at which directors are to be elected (i) by or at the direction of the Board of Directors or (ii) by any stockholder of the Corporation who is a stockholder of record at the time of giving notice provided for in this paragraph, who shall be entitled to vote at the meeting and who delivers written notice to the Secretary of the Corporation setting forth the information required by Section 5(b)(i). In the event the Corporation calls a special meeting of stockholders for the purpose of electing one or more directors to the Board of Directors, any such stockholder of record may nominate a person or persons (as the case may be), for election to such position(s) as specified in the Corporation's notice of meeting, if written notice setting forth the information required by Section 5(b)(i) of these Bylaws shall be received by the Secretary of the Corporation at the principal executive offices of the Corporation not later than the close of business on the later of the ninetieth (90th) day prior to such 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 of Directors to be elected at such meeting. The stockholder shall also update and supplement such information as required under Section 5(c). In no event shall an adjournment or a postponement of a special meeting for which notice has been given, or the public announcement thereof has been made, commence a new time period for the giving of a stockholder's notice as described above.

(d) Notwithstanding the foregoing provisions of this Section 6, a stockholder must also comply with all applicable requirements of the 1934 Act and the rules and regulations thereunder with respect to matters set forth in this Section 6. Nothing in these Bylaws shall be deemed to affect any rights of stockholders to request inclusion of proposals in the Corporation's proxy statement pursuant to Rule 14a-8 under the 1934 Act; *provided, however,* that any references in these Bylaws to the 1934 Act or the rules and regulations thereunder are not intended to and shall not limit the requirements applicable to nominations for the election to the Board of Directors to be considered pursuant to Section 6(c) of these Bylaws.

Section 7. Notice of Meetings. Except as otherwise provided by law, notice, given in writing or by electronic transmission, of each meeting of stockholders shall be given not less than ten (10) nor more than sixty (60) days before the date of the meeting to each stockholder entitled to vote at such meeting, such notice to specify the place, if any, date and hour, in the case of special meetings, the purpose or purposes of the meeting, and the means of remote communications, if any, by which stockholders and proxy holders may be deemed to be present in person and vote at any such meeting. If mailed, notice is given when deposited in the United States mail, postage prepaid, directed to the stockholder at such stockholder's address as it appears on the records of the Corporation. If sent via electronic transmission, notice is given as of the sending time recorded at the time of transmission. Notice of the time, place, if any, and purpose of any meeting of stockholders (to the extent required) may be waived in writing, signed by the person entitled to notice thereof, or by electronic transmission by such person, either before or after such meeting, and will be waived by any stockholder by his or her attendance thereat in person, by remote communication, if applicable, or by proxy duly authorized, except when the stockholder attends a meeting for the express purpose of objecting, at the beginning of the meeting, to the transaction of any business because the meeting is not lawfully called or convened. Any stockholder so waiving notice of such meeting shall be bound by the proceedings of any such meeting in all respects as if due notice thereof had been given.

Section 8. Quorum. At all meetings of stockholders, except where otherwise provided by statute or by the Amended and Restated Certificate of Incorporation, or by these Bylaws, the presence, in person, by remote communication, if applicable, or by proxy duly authorized, of the holders of a majority of the voting power of the outstanding shares of stock entitled to vote shall constitute a quorum for the transaction of business. In the absence of a quorum, any meeting of stockholders may be adjourned, from time to time, either by the chairperson of the meeting or by vote of the holders of a majority of the voting power of the shares represented thereat, but no other business shall be transacted at such meeting. The stockholders present at a duly called or convened meeting, at which a quorum is present, may continue to transact business until adjournment, notwithstanding the withdrawal of enough stockholders to leave less than a quorum. Except as otherwise provided by statute, by the Amended and Restated Certificate of Incorporation or these Bylaws, or by applicable stock exchange rules, in all matters other than the election of directors, the affirmative vote of the holders of a majority of the voting power of the shares present in person, by remote communication, if applicable, or represented by proxy duly authorized at the meeting and entitled to vote generally on the subject matter shall be the act of the stockholders. Except as otherwise provided by statute, by the Amended and Restated Certificate of Incorporation or these Bylaws, or by applicable stock exchange rules, directors shall be elected by a plurality of the votes of the shares present in person, by remote communication, if applicable, or represented by proxy duly authorized at the meeting and entitled to vote generally on the election of directors. Where a separate vote by a class or classes or series is required, except where otherwise provided by statute, by the Amended and Restated Certificate of Incorporation or these Bylaws, or by applicable stock exchange rules, a majority of the voting power of the outstanding shares of such class or classes or series, present in person, by remote communication, if applicable, or represented by proxy duly authorized, shall constitute a quorum entitled to take action with respect to that vote on that matter. Except as otherwise provided by statute, by the Amended and Restated Certificate of Incorporation or these Bylaws, or by applicable stock exchange rules, the affirmative vote of the holders of a majority (plurality, in the case of the election of directors) of shares of such class or classes or series present in person, by remote communication, if applicable, or represented by proxy duly authorized at the meeting shall be the act of such class or classes or series.

Section 9. Adjournment and Notice of Adjourned Meetings. Any meeting of stockholders, whether annual or special, may be adjourned from time to time either by the chairperson of the meeting or by the vote of the holders of a majority of the voting power of the shares present in person, by remote communication, if applicable, or represented by proxy duly authorized at the meeting. When a meeting is adjourned to another time or place, if any, notice need not be given of the adjourned meeting if the time and place, if any, thereof are announced at the meeting at which the adjournment is taken. At the adjourned meeting, the Corporation may transact any business that might have been transacted at the original meeting. If the adjournment is for more than thirty (30) days or if after the adjournment a new record date is fixed for the adjourned meeting, a notice of the adjourned meeting shall be given to each stockholder of record entitled to vote at the meeting.

Section 10. Voting Rights. For the purpose of determining those stockholders entitled to vote at any meeting of the stockholders, except as otherwise provided by law, only persons in whose names shares stand on the stock records of the Corporation on the record date, as provided in Section 12 of these Bylaws, shall be entitled to vote at any meeting of stockholders. Every person entitled to vote shall have the right to do so either in person, by remote communication, if applicable, or by an agent or agents authorized by a proxy granted in accordance with Delaware law. An agent so appointed need not be a stockholder. No proxy shall be voted after three (3) years from its date of creation unless the proxy provides for a longer period.

Section 11. Joint Owners of Stock. If shares or other securities having voting power stand of record in the names of two (2) or more persons, whether fiduciaries, members of a partnership, joint tenants, tenants in common, tenants by the entirety, or otherwise, or if two (2) or more persons have the same fiduciary relationship respecting the same shares, unless the Secretary of the Corporation is given written notice to the contrary and is furnished with a copy of the instrument or order appointing them or creating the relationship wherein it is so provided, their acts with respect to voting shall have the following effect: (a) if only one (1) votes, his or her act binds all; (b) if more than one (1) votes, the act of the majority so voting binds all; (c) if more than one (1) votes, but the vote is evenly split on any particular matter, each faction may vote the securities in question proportionally, or may apply to the Delaware Court of Chancery for relief as provided in the DGCL, Section 217(b). If the instrument filed with the Secretary of the Corporation shows that any such tenancy is held in unequal interests, a majority or even-split for the purpose of subsection (c) of this Section 11 shall be a majority or even-split in interest.

Section 12. List of Stockholders. The Secretary of the Corporation shall prepare and make, at least ten (10) days before every meeting of stockholders, a complete list of the stockholders entitled to vote at said meeting, arranged in alphabetical order, showing the address of each stockholder and the number and class of shares registered in the name of each stockholder. Such list shall be open to the examination of any stockholder, for any purpose germane to the meeting, (a) on a reasonably accessible electronic network, provided that the information required to gain access to such list is provided with the notice of the meeting, or (b) during ordinary business hours, at the principal place of business of the Corporation. In the event that the Corporation determines to make the list available on an electronic network, the Corporation may take reasonable steps to ensure that such information is available only to stockholders of the Corporation. The list shall be open to examination of any stockholder during the time of the meeting as provided by law.

Section 13. Action Without Meeting. Unless otherwise provided in the Amended and Restated Certificate of Incorporation, no action shall be taken by the stockholders of the Corporation except at an annual or special meeting of stockholders called in accordance with these Bylaws, and no action of the stockholders of the Corporation shall be taken by written consent or electronic transmission.

Section 14. Organization.

(a) At every meeting of stockholders, the Chairperson of the Board of Directors, or, if a Chairperson has not been appointed or is absent, the Chief Executive Officer, or if no Chief Executive Officer is then serving or is absent, the President, or, if the President is absent, a chairperson of the meeting chosen by a majority in interest of the stockholders entitled to vote, present in person or by proxy duly authorized, shall act as chairperson. The Chairperson of the Board may appoint the Chief Executive Officer as chairperson of the meeting. The Secretary of the Corporation, or, in his or her absence, an Assistant Secretary of the Corporation or other officer or other person directed to do so by the chairperson of the meeting, shall act as secretary of the meeting.

(b) The Board of Directors of the Corporation shall be entitled to make such rules or regulations for the conduct of meetings of stockholders as it shall deem necessary, appropriate or convenient. Subject to such rules and regulations of the Board of Directors, if any, the chairperson of the meeting shall have the right and authority to prescribe such rules, regulations and procedures and to do all such acts as, in the judgment of such chairperson, are necessary, appropriate or convenient for the proper conduct of the meeting, including, without limitation, establishing an agenda or order of business for the meeting, rules and procedures for maintaining order at the meeting and the safety of those present, limitations on participation in such meeting to stockholders of record of the Corporation and their duly authorized and constituted proxies and such other persons as the chairperson shall permit, restrictions on entry to the meeting after the time fixed for the commencement thereof, limitations on the time allotted to questions or comments by participants and regulation of the opening and closing of the polls for balloting on matters which are to be voted on by ballot. The date and time of the opening and closing of the polls for each matter upon which the stockholders will vote at the meeting shall be announced at the meeting. Unless and to the extent determined by the Board of Directors or the chairperson of the meeting, meetings of stockholders shall not be required to be held in accordance with rules of parliamentary procedure.

ARTICLE IV

DIRECTORS

Section 15. Number and Term of Office. The authorized number of directors of the Corporation shall be fixed in accordance with the Amended and Restated Certificate of Incorporation. Directors need not be stockholders unless so required by the Amended and Restated Certificate of Incorporation. If for any cause, the directors shall not have been elected at an annual meeting, they may be elected as soon thereafter as convenient at a special meeting of the stockholders called for that purpose in the manner provided in these Bylaws.

Section 16. Powers. The business and affairs of the Corporation shall be managed by or under the direction of the Board of Directors, except as may be otherwise provided by statute or by the Amended and Restated Certificate of Incorporation.

Section 17. Classes of Directors. Subject to the rights of the holders of any series of Preferred Stock to elect additional directors under specified circumstances, following the closing of the initial public offering pursuant to an effective registration statement under the 1933 Act, covering the offer and sale of Common Stock of the Corporation to the public (the "***Initial Public Offering***"), the directors shall be divided into three classes designated as Class I, Class II and Class III, respectively. The Board of Directors is authorized to assign members of the Board of Directors already in office to such classes at the time the classification becomes effective. At the first annual meeting of stockholders following the closing of the Initial Public Offering, the term of office of the Class I directors shall expire and Class I directors shall be elected for a full term of three years. At the second annual meeting of stockholders following the closing of the Initial Public Offering, the term of office of the Class II directors shall expire and Class II directors shall be elected for a full term of three years. At the third annual meeting of stockholders following the closing of the Initial Public Offering, the term of office of the Class III directors shall expire and Class III directors shall be elected for a full term of three years. At each succeeding annual meeting of stockholders, directors shall be elected for a full term of three years to succeed the directors of the class whose terms expire at such annual meeting.

Notwithstanding the foregoing provisions of this Section 17, each director shall serve until his or her successor is duly elected and qualified or until his or her earlier death, resignation or removal. No decrease in the number of directors constituting the Board of Directors shall shorten the term of any incumbent director.

Section 18. Vacancies. Unless otherwise provided in the Amended and Restated Certificate of Incorporation, and subject to the rights of the holders of any series of Preferred Stock or as otherwise provided by applicable law, any vacancies on the Board of Directors resulting from death, resignation, disqualification, removal or other causes and any newly created directorships resulting from any increase in the number of directors shall, unless the Board of Directors determines by resolution that any such vacancies or newly created directorships shall be filled by stockholders, be filled only by the affirmative vote of a majority of the directors then in office, even though less than a quorum of the Board of Directors, or by a sole remaining director, and not by the stockholders, *provided*, *however*, that whenever the holders of any class or classes of stock or series thereof are entitled to elect one or more directors by the provisions of the Amended and Restated Certificate of Incorporation, vacancies and newly created directorships of such class or classes or series shall, unless the Board of Directors determines by resolution that any such vacancies or newly created directorships shall be filled by stockholders, be filled by a majority of the directors elected by such class or classes or series thereof then in office, or by a sole remaining director so elected, and not by the stockholders. Any director elected in accordance with the preceding sentence shall hold office for the remainder of the full term of the director for which the vacancy was created or occurred and until such director's successor shall have been elected and qualified. A vacancy in the Board of Directors shall be deemed to exist under this Bylaw in the case of the death, removal or resignation of any director.

Section 19. Resignation. Any director may resign at any time by delivering his or her notice in writing or by electronic transmission to the Secretary of the Corporation, such resignation to specify whether it will be effective at a particular time. If no such specification is made, the Secretary of the Corporation, in his or her discretion, may either (a) require confirmation from the director prior to deeming the resignation effective, in which case the resignation will be deemed effective upon receipt of such confirmation, or (b) deem the resignation effective at the time of delivery of the resignation to the Secretary of the Corporation. When one or more directors shall resign from the Board of Directors, effective at a future date, a majority of the directors then in office, including those who have so resigned, shall have power to fill such vacancy or vacancies, the vote thereon to take effect when such resignation or resignations shall become effective, and each director so chosen shall hold office for the unexpired portion of the term of the director whose place shall be vacated and until his or her successor shall have been duly elected and qualified.

Section 20. Removal. Subject to any limitation imposed by applicable law, any individual director or directors may be removed from office with cause by the affirmative vote of the holders of at least sixty-six and two-thirds percent (66 2/3%) of the voting power of all then outstanding shares of capital stock of the Corporation entitled to vote generally at an election of directors, voting together as a single class.

Section 21. Meetings.

(a) Regular Meetings. Unless otherwise restricted by the Amended and Restated Certificate of Incorporation, regular meetings of the Board of Directors may be held at any time or date and at any place within or without the State of Delaware which has been designated by the Board of Directors and publicized among all directors, either orally or in writing, by telephone, including a voice-messaging system or other system designed to record and communicate messages, facsimile, telegraph or telex, or by electronic mail or other electronic means. No further notice shall be required for regular meetings of the Board of Directors.

(b) Special Meetings. Unless otherwise restricted by the Amended and Restated Certificate of Incorporation, special meetings of the Board of Directors may be held at any time and place within or without the State of Delaware whenever called by the Chairperson of the Board, the Chief Executive Officer or a majority of the total number of authorized directors.

(c) Meetings by Electronic Communications Equipment. Any member of the Board of Directors, or of any committee thereof, may participate in a meeting by means of conference telephone or other communications equipment by means of which all persons participating in the meeting can hear each other, and participation in a meeting by such means shall constitute presence in person at such meeting.

(d) Notice of Special Meetings. Notice of the time and place of all special meetings of the Board of Directors shall be orally or in writing, by telephone, including a voice messaging system or other system or technology designed to record and communicate messages, facsimile, telegraph or telex, or by electronic mail or other electronic means, during normal business hours, at least twenty-four (24) hours before the date and time of the meeting. If notice is sent by U.S. mail, it shall be sent by first class mail, postage prepaid, at least three (3) days before the date of the meeting. Notice of any meeting may be waived in writing, or by electronic transmission, at any time before or after the meeting and will be waived by any director by attendance thereat, except when the director attends the meeting for the express purpose of objecting, at the beginning of the meeting, to the transaction of any business because the meeting is not lawfully called or convened.

(e) Waiver of Notice. The transaction of all business at any meeting of the Board of Directors, or any committee thereof, however called or noticed, or wherever held, shall be as valid as though it had been transacted at a meeting duly held after regular call and notice, if a quorum be present and if, either before or after the meeting, each of the directors not present who did not receive notice shall sign a written waiver of notice or shall waive notice by electronic transmission. All such waivers shall be filed with the corporate records or made a part of the minutes of the meeting.

Section 22. Quorum and Voting.

(a) Unless the Amended and Restated Certificate of Incorporation requires a greater number, and except with respect to questions related to indemnification arising under Section 44 for which a quorum shall be one-third of the exact number of directors fixed from time to time, a quorum of the Board of Directors shall consist of a majority of the exact number of directors fixed from time to time by the Board of Directors in accordance with the Amended and Restated Certificate of Incorporation; *provided, however,* at any meeting whether a quorum be present or otherwise, a majority of the directors present may adjourn from time to time until the time fixed for the next regular meeting of the Board of Directors, without notice other than by announcement at the meeting.

(b) At each meeting of the Board of Directors at which a quorum is present, all questions and business shall be determined by the affirmative vote of a majority of the directors present, unless a different vote be required by law, the Amended and Restated Certificate of Incorporation or these Bylaws.

Section 23. Action Without Meeting. Unless otherwise restricted by the Amended and Restated Certificate of Incorporation or these Bylaws, any action required or permitted to be taken at any meeting of the Board of Directors or of any committee thereof may be taken without a meeting, if all members of the Board of Directors or committee, as the case may be, consent thereto in writing or by electronic transmission, and such writing or writings or transmission or transmissions are filed with the minutes of proceedings of the Board of Directors or committee. Such filing shall be in paper form if the minutes are maintained in paper form and shall be in electronic form if the minutes are maintained in electronic form.

Section 24. Fees and Compensation. Directors shall be entitled to such compensation for their services as may be approved by the Board of Directors, including, if so approved, by resolution of the Board of Directors, a fixed sum and expenses of attendance, if any, for attendance at each regular or special meeting of the Board of Directors and at any meeting of a committee of the Board of Directors. Nothing herein contained shall be construed to preclude any director from serving the Corporation in any other capacity as an officer, agent, employee, or otherwise and receiving compensation therefor.

Section 25. Committees.

(a) Executive Committee. The Board of Directors may appoint an Executive Committee to consist of one (1) or more members of the Board of Directors. The Executive Committee, to the extent permitted by law and provided in the resolution of the Board of Directors shall have and may exercise all the powers and authority of the Board of Directors in the management of the business and affairs of the Corporation, and may authorize the seal of the Corporation to be affixed to all papers which may require it; but no such committee shall have the power or authority in reference to (i) approving or adopting, or recommending to the stockholders, any action or matter (other than the election or removal of directors) expressly required by the DGCL to be submitted to stockholders for approval, or (ii) adopting, amending or repealing any Bylaw of the Corporation.

(b) Other Committees. The Board of Directors may, from time to time, appoint such other committees as may be permitted by law. Such other committees appointed by the Board of Directors shall consist of one (1) or more members of the Board of Directors and shall have such powers and perform such duties as may be prescribed by the resolution or resolutions creating such committees, but in no event shall any such committee have the power or authority denied to the Executive Committee in these Bylaws.

(c) Term. The Board of Directors, subject to any requirements of any outstanding series of Preferred Stock and the provisions of subsections (a) or (b) of this Section 25, may at any time increase or decrease the number of members of a committee or terminate the existence of a committee. The membership of a committee member shall terminate on the date of his or her death or voluntary resignation from the committee or from the Board of Directors. The Board of Directors may at any time for any reason remove any individual committee member and the Board of Directors may fill any committee vacancy created by death, resignation, removal or increase in the number of members of the committee. The Board of Directors may appoint one or more directors as alternate members of any committee, who may replace any absent or disqualified member at any meeting of the committee, and, in addition, in the absence or disqualification of any member of a committee, the member or members thereof present at any meeting and not disqualified from voting, whether or not he, she or they constitute a quorum, may unanimously appoint another member of the Board of Directors to act at the meeting in the place of any such absent or disqualified member.

(d) Meetings. Unless the Board of Directors shall otherwise provide, regular meetings of the Executive Committee or any other committee appointed pursuant to this Section 25 shall be held at such times and places as are determined by the Board of Directors, or by any such committee, and when notice thereof has been given to each member of such

committee, no further notice of such regular meetings need be given thereafter. Special meetings of any such committee may be held at any place which has been determined from time to time by such committee, and may be called by any director who is a member of such committee, upon notice to the members of such committee of the time and place of such special meeting given in the manner provided for the giving of notice to members of the Board of Directors of the time and place of special meetings of the Board of Directors. Notice of any special meeting of any committee may be waived in writing or by electronic transmission at any time before or after the meeting and will be waived by any director by attendance thereat, except when the director attends such special meeting for the express purpose of objecting, at the beginning of the meeting, to the transaction of any business because the meeting is not lawfully called or convened. Unless otherwise provided by the Board of Directors in the resolutions authorizing the creation of the committee, a majority of the authorized number of members of any such committee shall constitute a quorum for the transaction of business, and the act of a majority of those present at any meeting at which a quorum is present shall be the act of such committee. Unless the Board of Directors shall otherwise provide, each committee shall conduct its business in the same manner as the Board of Directors conducts its business pursuant to Article IV of these Bylaws.

Section 26. Duties of Chairperson of the Board of Directors and Lead Independent Director.

(a) The Chairperson of the Board of Directors, if appointed and when present, shall preside at all meetings of the stockholders and the Board of Directors. The Chairperson of the Board of Directors shall perform other duties commonly incident to the office and shall also perform such other duties and have such other powers, as the Board of Directors shall designate from time to time.

(b) The Chairperson of the Board of Directors, or if the Chairperson is not an independent director, one of the independent directors, may be designated by the Board of Directors as lead independent director to serve until replaced by the Board of Directors (the "***Lead Independent Director***"). The Lead Independent Director will, with the Chiarperson of the Board of Directors and the Chief Executive Officer, establish the agenda for regular Board of Directors meetings and serve as chairperson of the Board of Directors meetings in the absence of the Chairperson of the Board of Directors; establish the agenda for meetings of the independent directors and preside over such meetings; coordinate with the committee chairs regarding meeting agendas and informational requirements; preside over any portions of meetings of the Board of Directors at which the evaluation or compensation of the Chief Executive Officer is presented or discussed; preside over any portions of any meetings of the Board of Directors at which the performance of the Board of Directors is presented or discussed; and perform such other duties as may be established or delegated by the Board of Directors.

Section 27. Organization. At every meeting of the directors, the Chairperson of the Board of Directors, or, if a Chairperson has not been appointed or is absent, the Lead Independent Director, or if the Lead Independent Director has not been appointed or is absent, the Chief Executive Officer (if a director), or, if a Chief Executive Officer is absent, the President (if a director), or if the President is absent, the most senior Vice President (if a director), or, in the absence of any such person, a chairperson of the meeting chosen by a majority of the directors present, shall preside over the meeting. The Secretary of the Corporation, or in his or her absence, any Assistant Secretary of the Corporation or other officer, director or other person directed to do so by the person presiding over the meeting, shall act as secretary of the meeting.

ARTICLE V

OFFICERS

Section 28. Officers Designated. The officers of the Corporation shall include, if and when designated by the Board of Directors, the Chief Executive Officer, the President, one or more Vice Presidents, the Secretary, the Chief Financial Officer and the Treasurer. The Board of Directors may also appoint one or more Assistant Secretaries and Assistant Treasurers and such other officers and agents with such powers and duties as it shall deem necessary. The Board of Directors may assign such additional titles to one or more of the officers as it shall deem appropriate. Any one person may hold any number of offices of the Corporation at any one time unless specifically prohibited therefrom by law. The salaries and other compensation of the officers of the Corporation shall be fixed by or in the manner designated by the Board of Directors or a committee thereof to which the Board of Directors has delegated such responsibility.

Section 29. Tenure and Duties of Officers.

(a) General. All officers shall hold office at the pleasure of the Board of Directors and until their successors shall have been duly elected and qualified, unless sooner removed. Any officer elected or appointed by the Board of Directors may be removed at any time by the Board of Directors. If the office of any officer becomes vacant for any reason, the vacancy may be filled by the Board of Directors.

(b) Duties of Chief Executive Officer. The Chief Executive Officer shall preside at all meetings of the stockholders and at all meetings of the Board of Directors (if a director), unless the Chairperson of the Board of Directors or the Lead Independent Director has been appointed and is present. Unless an officer has been appointed Chief Executive Officer of the Corporation, the President shall be the chief executive officer of the Corporation and shall, subject to the control of the Board of Directors, have general supervision, direction and control of the business and officers of the Corporation. To the extent that a Chief Executive Officer has been appointed and no President has been appointed, all references in these Bylaws to the President shall be deemed references to the Chief Executive Officer. The Chief Executive Officer shall perform other duties commonly incident to the office and shall also perform such other duties and have such other powers, as the Board of Directors shall designate from time to time.

(c) Duties of President. The President shall preside at all meetings of the stockholders and at all meetings of the Board of Directors (if a director), unless the Chairperson of the Board of Directors, the Lead Independent Director or the Chief Executive Officer has been appointed and is present. Unless another officer has been appointed Chief Executive Officer of the Corporation, the President shall be the chief executive officer of the Corporation and shall,

subject to the control of the Board of Directors, have general supervision, direction and control of the business and officers of the Corporation. The President shall perform other duties commonly incident to the office and shall also perform such other duties and have such other powers, as the Board of Directors shall designate from time to time.

(d) Duties of Vice Presidents. A Vice President may assume and perform the duties of the President in the absence or disability of the President or whenever the office of President is vacant. A Vice President shall perform other duties commonly incident to their office and shall also perform such other duties and have such other powers as the Board of Directors or the Chief Executive Officer, or, if the Chief Executive Officer has not been appointed or is absent, the President shall designate from time to time.

(e) Duties of Secretary. The Secretary of the Corporation shall attend all meetings of the stockholders and of the Board of Directors and shall record all acts and proceedings thereof in the minute book of the Corporation. The Secretary of the Corporation shall give notice in conformity with these Bylaws of all meetings of the stockholders and of all meetings of the Board of Directors and any committee thereof requiring notice. The Secretary of the Corporation shall perform all other duties provided for in these Bylaws and other duties commonly incident to the office and shall also perform such other duties and have such other powers, as the Board of Directors shall designate from time to time. The Chief Executive Officer, or if no Chief Executive Officer is then serving, the President may direct any Assistant Secretary of the Corporation or other officer to assume and perform the duties of the Secretary in the absence or disability of the Secretary, and each Assistant Secretary of the Corporation shall perform other duties commonly incident to the office and shall also perform such other duties and have such other powers as the Board of Directors or the Chief Executive Officer, or if no Chief Executive Officer is then serving, the President shall designate from time to time.

(f) Duties of Chief Financial Officer. The Chief Financial Officer shall keep or cause to be kept the books of account of the Corporation in a thorough and proper manner and shall render statements of the financial affairs of the Corporation in such form and as often as required by the Board of Directors or the Chief Executive Officer, or if no Chief Executive officer is then serving, the President. The Chief Financial Officer, subject to the order of the Board of Directors, shall have the custody of all funds and securities of the Corporation. The Chief Financial Officer shall perform other duties commonly incident to the office and shall also perform such other duties and have such other powers as the Board of Directors or the Chief Executive Officer, or if no Chief Executive Officer is then serving, the President shall designate from time to time. To the extent that a Chief Financial Officer has been appointed and no Treasurer has been appointed, all references in these Bylaws to the Treasurer shall be deemed references to the Chief Financial Officer. The President may direct the Treasurer, if any, or any Assistant Treasurer, or the controller or any assistant controller to assume and perform the duties of the Chief Financial Officer in the absence or disability of the Chief Financial Officer, and each Treasurer and Assistant Treasurer and each controller and assistant controller shall perform other duties commonly incident to the office and shall also perform such other duties and have such other powers as the Board of Directors or the Chief Executive Officer, or if no Chief Executive Officer is then serving, the President shall designate from time to time.

(g) Duties of Treasurer. Unless another officer has been appointed Chief Financial Officer of the Corporation, the Treasurer shall be the chief financial officer of the Corporation and shall keep or cause to be kept the books of account of the Corporation in a thorough and proper manner and shall render statements of the financial affairs of the Corporation in such form and as often as required by the Board of Directors or the Chief Executive Officer, or if no Chief Executive Officer is then serving, the President, and, subject to the order of the Board of Directors, shall have the custody of all funds and securities of the Corporation. The Treasurer shall perform other duties commonly incident to the office and shall also perform such other duties and have such other powers as the Board of Directors or the Chief Executive Officer, or if no Chief Executive Officer is then serving, the President and the Chief Financial Officer (if not Treasurer) shall designate from time to time.

Section 30. Delegation of Authority. The Board of Directors may from time to time delegate the powers or duties of any officer to any other officer or agent, notwithstanding any provision hereof.

Section 31. Resignations. Any officer may resign at any time by giving notice in writing or by electronic transmission to the Board of Directors or to the Chief Executive Officer, or if no Chief Executive Officer is then serving, the President or to the Secretary of the Corporation. Any such resignation shall be effective when received by the person or persons to whom such notice is given, unless a later time is specified therein, in which event the resignation shall become effective at such later time. Unless otherwise specified in such notice, the acceptance of any such resignation 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 with the resigning officer.

Section 32. Removal. Any officer may be removed from office at any time, either with or without cause, by the affirmative vote of a majority of the directors in office at the time, or by the unanimous written consent of the directors in office at the time, or by any committee or by the Chief Executive Officer or by other superior officers upon whom such power of removal may have been conferred by the Board of Directors.

ARTICLE VI

EXECUTION OF CORPORATE INSTRUMENTS AND VOTING OF SECURITIES OWNED BY THE CORPORATION

Section 33. Execution of Corporate Instruments. The Board of Directors may, in its discretion, determine the method and designate the signatory officer or officers, or other person or persons, to execute on behalf of the Corporation any corporate instrument or document, or to sign on behalf of the Corporation the corporate name without limitation, or to enter into contracts on behalf of the Corporation, except where otherwise provided by law or these Bylaws, and such execution or signature shall be binding upon the Corporation.

All checks and drafts drawn on banks or other depositaries on funds to the credit of the Corporation or in special accounts of the Corporation shall be signed by such person or persons as the Board of Directors shall authorize so to do.

Unless authorized or ratified by the Board of Directors or within the agency power of an officer, no officer, agent or employee shall have any power or authority to bind the Corporation by any contract or engagement or to pledge its credit or to render it liable for any purpose or for any amount.

Section 34. Voting of Securities Owned By the Corporation. All stock and other securities of other Corporations owned or held by the Corporation for itself, or for other parties in any capacity, shall be voted, and all proxies with respect thereto shall be executed, by the person authorized so to do by resolution of the Board of Directors, or, in the absence of such authorization, by the Chairperson of the Board of Directors, the Chief Executive Officer, the President, or any Vice President.

ARTICLE VII

SHARES OF STOCK

Section 35. Form and Execution of Certificates. The shares of the Corporation shall be represented by certificates, or shall be uncertificated if so provided by resolution or resolutions of the Board of Directors. Certificates for the shares of stock, if any, shall be in such form as is consistent with the Amended and Restated Certificate of Incorporation and applicable law. Every holder of stock in the Corporation represented by certificate shall be entitled to have a certificate signed by or in the name of the Corporation by any two authorized officers of the Corporation, including but not limited to, the Chief Executive Officer, the President, the Chief Financial Officer, any Vice President, the Treasurer or Assistant Treasurer or the Secretary or Assistant Secretary, certifying the number of shares owned by him in the Corporation. Any or all of the signatures on the certificate may be facsimiles. In case any officer, transfer agent, or registrar who has signed or whose facsimile signature has been placed upon a certificate shall have ceased to be such officer, transfer agent, or registrar before such certificate is issued, it may be issued with the same effect as if he or she were such officer, transfer agent, or registrar at the date of issue.

Section 36. Lost Certificates. A new certificate or certificates shall be issued in place of any certificate or certificates theretofore issued by the Corporation alleged to have been lost, stolen, or destroyed, upon the making of an affidavit of that fact by the person claiming the certificate of stock to be lost, stolen, or destroyed. The Corporation may require, as a condition precedent to the issuance of a new certificate or certificates, the owner of such lost, stolen, or destroyed certificate or certificates, or the owner's legal representative, to agree to indemnify the Corporation in such manner as it shall require or to give the Corporation a surety bond in such form and amount as it may direct as indemnity against any claim that may be made against the Corporation with respect to the certificate alleged to have been lost, stolen, or destroyed.

Section 37. Transfers.

(a) Transfers of record of shares of stock of the Corporation shall be made only upon its books by the holders thereof, in person or by attorney duly authorized, and, in the case of stock represented by certificate, upon the surrender of a properly endorsed certificate or certificates for a like number of shares.

(b) The Corporation shall have power to enter into and perform any agreement with any number of stockholders of any one or more classes of stock of the Corporation to restrict the transfer of shares of stock of the Corporation of any one or more classes owned by such stockholders in any manner not prohibited by the DGCL.

Section 38. Fixing Record Dates.

(a) In order that the Corporation may determine the stockholders entitled to notice of or to vote at any meeting of stockholders or any adjournment thereof, the Board of Directors may fix a record date, which record date shall not precede the date upon which the resolution fixing the record date is adopted by the Board of Directors, and which record date shall, subject to applicable law, not be more than sixty (60) nor less than ten (10) days before the date of such meeting. If no record date is fixed by the Board of Directors, the record date for determining stockholders entitled to notice of or to vote at a meeting of stockholders shall be at the close of business on the day next preceding the day on which notice is given, or if notice is waived, at the close of business on the day next preceding the day on which the meeting is held. A determination of stockholders of record entitled to notice of or to vote at a meeting of stockholders shall apply to any adjournment of the meeting; *provided, however,* that the Board of Directors may fix a new record date for the adjourned meeting.

(b) In order that the Corporation may determine the stockholders entitled to receive payment of any dividend or other distribution or allotment of any rights or the stockholders entitled to exercise any rights in respect of any change, conversion or exchange of stock, or for the purpose of any other lawful action, the Board of Directors may fix, in advance, a record date, which record date shall not precede the date upon which the resolution fixing the record date is adopted, and which record date shall be not more than sixty (60) days prior to such action. If no record date is fixed, the record date for determining stockholders for any such purpose shall be at the close of business on the day on which the Board of Directors adopts the resolution relating thereto.

Section 39. Registered Stockholders. The Corporation shall be entitled to recognize the exclusive right of a person registered on its books as the owner of shares to receive dividends, and to vote as such owner, and shall not be bound to recognize any equitable or other claim to or interest in such share or shares on the part of any other person whether or not it shall have express or other notice thereof, except as otherwise provided by the laws of Delaware.

ARTICLE VIII

OTHER SECURITIES OF THE CORPORATION

Section 40. Execution of Other Securities. All bonds, debentures and other corporate securities of the Corporation, other than stock certificates (covered in Section 35), may be signed by the Chief Executive Officer, the President or any Vice President, or such other person as may be authorized by the Board of Directors, and if such securities require it, the corporate seal may be impressed thereon or a facsimile of such seal may be imprinted thereon and attested by the signature of the Secretary of the Corporation or an Assistant Secretary of the Corporation, or the Chief Financial Officer or Treasurer or an Assistant Treasurer; *provided, however,* that where

any such bond, debenture or other corporate security shall be authenticated by the manual signature, or where permissible facsimile signature, of a trustee under an indenture pursuant to which such bond, debenture or other corporate security shall be issued, the signatures of the persons signing and attesting the corporate seal on such bond, debenture or other corporate security may be the imprinted facsimile of the signatures of such persons. Interest coupons appertaining to any such bond, debenture or other corporate security, authenticated by a trustee as aforesaid, shall be signed by the Treasurer or an Assistant Treasurer of the Corporation or such other person as may be authorized by the Board of Directors, or bear imprinted thereon the facsimile signature of such person. In case any officer who shall have signed or attested any bond, debenture or other corporate security, or whose facsimile signature shall appear thereon or on any such interest coupon, shall have ceased to be such officer before the bond, debenture or other corporate security so signed or attested shall have been delivered, such bond, debenture or other corporate security nevertheless may be adopted by the Corporation and issued and delivered as though the person who signed the same or whose facsimile signature shall have been used thereon had not ceased to be such officer of the Corporation.

ARTICLE IX

DIVIDENDS

Section 41. Declaration of Dividends. Dividends upon the capital stock of the Corporation, subject to the provisions of the Amended and Restated Certificate of Incorporation and applicable law, if any, may be declared by the Board of Directors pursuant to law at any regular or special meeting. Dividends may be paid in cash, in property, or in shares of the capital stock, subject to the provisions of the Amended and Restated Certificate of Incorporation and applicable law.

Section 42. Dividend Reserve. Before payment of any dividend, there may be set aside out of any funds of the Corporation available for dividends such sum or sums as the Board of Directors from time to time, in their absolute discretion, think proper as a reserve or reserves to meet contingencies, or for equalizing dividends, or for repairing or maintaining any property of the Corporation, or for such other purpose as the Board of Directors shall think conducive to the interests of the Corporation, and the Board of Directors may modify or abolish any such reserve in the manner in which it was created.

ARTICLE X

FISCAL YEAR

Section 43. Fiscal Year. The fiscal year of the Corporation shall be fixed by resolution of the Board of Directors.

ARTICLE XI

INDEMNIFICATION

Section 44. Indemnification of Directors, Executive Officers, Other Officers, Employees and Other Agents.

(a) Directors and Executive Officers. The Corporation shall indemnify its directors and executive officers (for the purposes of this Article XI, "***executive officers***" shall have the meaning defined in Rule 3b-7 promulgated under the 1934 Act) to the extent not prohibited by the DGCL or any other applicable law; *provided, however,* that the Corporation may modify the extent of such indemnification by individual contracts with its directors and executive officers; and, *provided, further,* that the Corporation shall not be required to indemnify any director or executive officer in connection with any proceeding (or part thereof) initiated by such person unless (i) such indemnification is expressly required to be made by law, (ii) the proceeding was authorized by the Board of Directors of the Corporation, (iii) such indemnification is provided by the Corporation, in its sole discretion, pursuant to the powers vested in the Corporation under the DGCL or any other applicable law or (iv) such indemnification is required to be made under subsection (d).

(b) Other Officers, Employees and Other Agents. The Corporation shall have power to indemnify (including the power to advance expenses in a manner consistent with subsection (c) of this Bylaw) its other officers, employees and other agents as set forth in the DGCL or any other applicable law. The Board of Directors shall have the power to delegate the determination of whether indemnification shall be given to any such person except executive officers to such officers or other persons as the Board of Directors shall determine.

(c) Expenses. The Corporation shall advance to any person who was or is a party or is threatened to be made a party to any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative, by reason of the fact that such person is or was a director or executive officer, of the Corporation, or is or was serving at the request of the Corporation as a director or executive officer of another Corporation, partnership, joint venture, trust or other enterprise, prior to the final disposition of the proceeding, promptly following request therefor, all expenses incurred by any director or executive officer in connection with such proceeding provided, however, that if the DGCL requires, an advancement of expenses incurred by a director or executive officer in his or her capacity as a director or executive officer (and not in any other capacity in which service was or is rendered by such indemnitee, including, without limitation, service to an employee benefit plan) shall be made only upon delivery to the Corporation of an undertaking (hereinafter an "***undertaking***"), by or on behalf of such indemnitee, to repay all amounts so advanced if it shall ultimately be determined by final judicial decision from which there is no further right to appeal (hereinafter a "***final adjudication***") that such indemnitee is not entitled to be indemnified for such expenses under this section or otherwise.

Notwithstanding the foregoing, unless otherwise determined pursuant to paragraph (e) of this section, no advance shall be made by the Corporation to an executive officer of the Corporation (except by reason of the fact that such executive officer is or was a director of the Corporation in which event this paragraph shall not apply) in any action, suit or proceeding, whether civil, criminal, administrative or investigative, if a determination is reasonably and promptly made (i) by a majority vote of directors who were not parties to the proceeding, even if not a quorum, or (ii) by a committee of such directors designated by a majority vote of such directors, even though less than a quorum, or (iii) if there are no such directors, or such directors so direct, by independent legal counsel in a written opinion, that the facts known to the decision-making party at the time such determination is made demonstrate clearly and convincingly that such person acted in bad faith or in a manner that such person did not believe to be in or not opposed to the best interests of the Corporation.

(d) Enforcement. Without the necessity of entering into an express contract, all rights to indemnification and advances to directors and executive officers under this Bylaw shall be deemed to be contractual rights and be effective to the same extent and as if provided for in a contract between the Corporation and the director or executive officer. Any right to indemnification or advances granted by this section to a director or executive officer shall be enforceable by or on behalf of the person holding such right in any court of competent jurisdiction if (i) the claim for indemnification or advances is denied, in whole or in part, or (ii) no disposition of such claim is made within ninety (90) days of request therefor. To the extent permitted by law, the claimant in such enforcement action, if successful in whole or in part, shall be entitled to be paid also the expense of prosecuting the claim. In connection with any claim for indemnification, the Corporation shall be entitled to raise as a defense to any such action that the claimant has not met the standards of conduct that make it permissible under the DGCL or any other applicable law for the Corporation to indemnify the claimant for the amount claimed. In connection with any claim by an executive officer of the Corporation (except in any action, suit or proceeding, whether civil, criminal, administrative or investigative, by reason of the fact that such executive officer is or was a director of the Corporation) for advances, the Corporation shall be entitled to raise a defense as to any such action clear and convincing evidence that such person acted in bad faith or in a manner that such person did not believe to be in or not opposed to the best interests of the Corporation, or with respect to any criminal action or proceeding that such person acted without reasonable cause to believe that his or her conduct was lawful. Neither the failure of the Corporation (including its Board of Directors, independent legal counsel or its stockholders) to have made a determination prior to the commencement of such action that indemnification of the claimant is proper in the circumstances because he or she has met the applicable standard of conduct set forth in the DGCL or any other applicable law, nor an actual determination by the Corporation (including its Board of Directors, independent legal counsel or its stockholders) that the claimant has not met such applicable standard of conduct, shall be a defense to the action or create a presumption that claimant has not met the applicable standard of conduct. In any suit brought by a director or executive officer to enforce a right to indemnification or to an advancement of expenses hereunder, the burden of proving that the director or executive officer is not entitled to be indemnified, or to such advancement of expenses, under this section or otherwise shall be on the Corporation.

(e) Non-Exclusivity of Rights. The rights conferred on any person by this Bylaw shall not be exclusive of any other right which such person may have or hereafter acquire under any applicable statute, provision of the Amended and Restated Certificate of Incorporation, Bylaws, agreement, vote of stockholders or disinterested directors or otherwise, both as to action in his or her official capacity and as to action in another capacity while holding office. The Corporation is specifically authorized to enter into individual contracts with any or all of its directors, officers, employees or agents respecting indemnification and advances, to the fullest extent not prohibited by the DGCL, or by any other applicable law.

(f) Survival of Rights. The rights conferred on any person by this Bylaw shall continue as to a person who has ceased to be a director or executive officer, or other officer, employee or other agent and shall inure to the benefit of the heirs, executors and administrators of such a person.

(g) Insurance. To the fullest extent permitted by the DGCL or any other applicable law, the Corporation, upon approval by the Board of Directors, may purchase insurance on behalf of any person required or permitted to be indemnified pursuant to this section.

(h) Amendments. Any repeal or modification of this section shall only be prospective and shall not affect the rights under this Bylaw in effect at the time of the alleged occurrence of any action or omission to act that is the cause of any proceeding against any agent of the Corporation.

(i) Saving Clause. If this Bylaw or any portion hereof shall be invalidated on any ground by any court of competent jurisdiction, then the Corporation shall nevertheless indemnify each director and executive officer to the full extent not prohibited by any applicable portion of this section that shall not have been invalidated, or by any other applicable law. If this section shall be invalid due to the application of the indemnification provisions of another jurisdiction, then the Corporation shall indemnify each director and executive officer to the full extent under any other applicable law.

(j) Certain Definitions. For the purposes of this Bylaw, the following definitions shall apply:

(i) The term "***proceeding***" shall be broadly construed and shall include, without limitation, the investigation, preparation, prosecution, defense, settlement, arbitration and appeal of, and the giving of testimony in, any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative.

(ii) The term "***expenses***" shall be broadly construed and shall include, without limitation, court costs, attorneys' fees, witness fees, fines, amounts paid in settlement or judgment and any other costs and expenses of any nature or kind incurred in connection with any proceeding.

(iii) The term the "***Corporation***" shall include, in addition to the resulting corporation, any constituent corporation (including any constituent of a constituent) absorbed in a consolidation or merger which, if its separate existence had continued, would have had power and authority to indemnify its directors, officers, and employees or agents, so that any person who is or was a director, officer, employee or agent of such constituent corporation, or is or was serving at the request of such constituent corporation as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise, shall stand in the same position under the provisions of this section with respect to the resulting or surviving corporation as he or she would have with respect to such constituent corporation if its separate existence had continued.

(iv) References to a "***director***," "***executive officer***," "***officer***," "***employee***," or "***agent***" of the Corporation shall include, without limitation, situations where such person is serving at the request of the Corporation as, respectively, a director, executive officer, officer, employee, trustee or agent of another Corporation, partnership, joint venture, trust or other enterprise.

(v) References to "***other enterprises***" shall include employee benefit plans; references to "***fines***" shall include any excise taxes assessed on a person with respect to an employee benefit plan; and references to "***serving at the request of the Corporation***" shall include any service as a director, officer, employee or agent of the Corporation which imposes duties on, or involves services by, such director, officer, employee, or agent with respect to an employee benefit plan, its participants, or beneficiaries; and a person who acted in good faith and in a manner such person reasonably believed to be in the interest of the participants and beneficiaries of an employee benefit plan shall be deemed to have acted in a manner "***not opposed to the best interests of the Corporation***" as referred to in this section.

ARTICLE XII

NOTICES

Section 45. Notices.

(a) Notice to Stockholders. Written notice to stockholders of stockholder meetings shall be given as provided in Section 7 herein. Without limiting the manner by which notice may otherwise be given effectively to stockholders under any agreement or contract with such stockholder, and except as otherwise required by law, written notice to stockholders for purposes other than stockholder meetings may be sent by U.S. mail or nationally recognized overnight courier, or by facsimile, telegraph or telex or by electronic mail or other electronic means.

(b) Notice to Directors. Any notice required to be given to any director may be given by the method stated in subsection (a), or as otherwise provided in these Bylaws, with notice other than one which is delivered personally to be sent to such address as such director shall have filed in writing with the Secretary of the Corporation, or, in the absence of such filing, to the last known address of such director.

(c) Affidavit of Mailing. An affidavit of mailing, executed by a duly authorized and competent employee of the Corporation or its transfer agent appointed with respect to the class of stock affected, or other agent, specifying the name and address or the names and addresses of the stockholder or stockholders, or director or directors, to whom any such notice or notices was or were given, and the time and method of giving the same, shall in the absence of fraud, be prima facie evidence of the facts therein contained.

(d) Methods of Notice. It shall not be necessary that the same method of giving notice be employed in respect of all recipients of notice, but one permissible method may be employed in respect of any one or more, and any other permissible method or methods may be employed in respect of any other or others.

(e) Notice to Person With Whom Communication is Unlawful. Whenever notice is required to be given, under any provision of law or of the Amended and Restated Certificate of Incorporation or Bylaws of the Corporation, to any person with whom communication is unlawful, the giving of such notice to such person shall not be required and there shall be no duty to apply to any governmental authority or agency for a license or permit to give such notice to such person. Any action or meeting which shall be taken or held without notice to any such person with whom communication is unlawful shall have the same force and effect as if such notice had been duly given. In the event that the action taken by the Corporation is such as to require the filing of a certificate under any provision of the DGCL, the certificate shall state, if such is the fact and if notice is required, that notice was given to all persons entitled to receive notice except such persons with whom communication is unlawful.

(f) Notice to Stockholders Sharing an Address. Except as otherwise prohibited under DGCL, any notice given under the provisions of DGCL, the Amended and Restated Certificate of Incorporation or these Bylaws shall be effective if given by a single written notice to stockholders who share an address if consented to by the stockholders at that address to whom such notice is given. Such consent shall have been deemed to have been given if such stockholder fails to object in writing to the Corporation within sixty (60) days of having been given notice by the Corporation of its intention to send the single notice. Any consent shall be revocable by the stockholder by written notice to the Corporation.

ARTICLE XIII

AMENDMENTS

Section 46. Amendments. Subject to the limitations set forth in Section 44(h) of these Bylaws or the provisions of the Amended and Restated Certificate of Incorporation, the Board of Directors is expressly empowered to adopt, amend or repeal these Bylaws of the Corporation. Any adoption, amendment or repeal of these Bylaws of the Corporation by the Board of Directors shall require the approval of a majority of the authorized number of directors. The stockholders also shall have power to adopt, amend or repeal these Bylaws of the Corporation; *provided*, *however*, that, in addition to any vote of the holders of any class or series of stock of the Corporation required by law or by the Amended and Restated Certificate of Incorporation, such action by stockholders shall require the affirmative vote of the holders of at least sixty-six and two-thirds percent (66-2/3%) of the voting power of all of the then-outstanding shares of the capital stock of the Corporation entitled to vote generally in the election of directors, voting together as a single class.

ARTICLE XIV

LOANS TO OFFICERS

Section 47. Loans to Officers. Except as otherwise prohibited by applicable law, the Corporation may lend money to, or guarantee any obligation of, or otherwise assist any officer or other employee of the Corporation or of its subsidiaries, including any officer or employee who is a director of the Corporation or its subsidiaries, whenever, in the judgment of the Board of Directors, such loan, guarantee or assistance may reasonably be expected to benefit the Corporation. The loan, guarantee or other assistance may be with or without interest and may be unsecured, or secured in such manner as the Board of Directors shall approve, including, without limitation, a pledge of shares of stock of the Corporation. Nothing in these Bylaws shall be deemed to deny, limit or restrict the powers of guaranty or warranty of the Corporation at common law or under any statute.

ZQ|CERT#|COY|CLS|RGSTRY|ACCT#|TRANSTYPE|RUN#|TRANS#

COMMON STOCK

PAR VALUE $0.0001

COMMON STOCK

Certificate Number

ZQ00000000

Personalis

Shares

PERSONALIS, INC.

INCORPORATED UNDER THE LAWS OF THE STATE OF DELAWARE

THIS CERTIFIES THAT

MR. SAMPLE & MRS. SAMPLE &
MR. SAMPLE & MRS. SAMPLE

SEE REVERSE FOR CERTAIN DEFINITIONS

CUSIP 71535D 10 6

is the owner of

***ZERO HUNDRED THOUSAND
ZERO HUNDRED AND ZERO***

THIS CERTIFICATE IS TRANSFERABLE IN CITIES DESIGNATED BY THE TRANSFER AGENT, AVAILABLE ONLINE AT www.computershare.com

FULLY-PAID AND NON-ASSESSABLE SHARES OF COMMON STOCK OF

Personalis, Inc. (hereinafter called the "Company"), transferable on the books of the Company in person or by duly authorized attorney, upon surrender of this Certificate properly endorsed. This Certificate and the shares represented hereby, are issued and shall be held subject to all of the provisions of the Certificate of Incorporation, as amended, and the Bylaws, as amended, of the Company (copies of which are on file with the Company and with the Transfer Agent), to all of which each holder, by acceptance hereof, assents. This Certificate is not valid unless countersigned and registered by the Transfer Agent and Registrar.

Witness the facsimile seal of the Company and the facsimile signatures of its duly authorized officers.

DATED DD-MMM-YYYY

FACSIMILE SIGNATURE TO COME

President

FACSIMILE SIGNATURE TO COME

Secretary

PERSONALIS, INC. CORPORATE SEAL 2/21/2011 DELAWARE

COUNTERSIGNED AND REGISTERED:
COMPUTERSHARE TRUST COMPANY, N.A.
TRANSFER AGENT AND REGISTRAR,

By _____
AUTHORIZED SIGNATURE

SECURITY INSTRUCTIONS ON REVERSE

1234567

Personalis

PO BOX 43004, Providence, RI 02940-3004

MR A SAMPLE
DESIGNATION (IF ANY)
ADD 1
ADD 2
ADD 3
ADD 4

CUSIP/IDENTIFIER XXXXXX XX X
Holder ID XXXXXXXXXX
Insurance Value 1,000,000.00
Number of Shares 123456
DTC 12345678 12345678901234 5

Certificate Numbers	Num	No. Denom.	Total
12345678901234567890	1	1	1
12345678901234567890	2	2	2
12345678901234567890	3	3	3
12345678901234567890	4	4	4
12345678901234567890	5	5	5
12345678901234567890	6	6	6
Total Transaction			7

PERSONALIS, INC.

THE COMPANY WILL FURNISH WITHOUT CHARGE TO EACH SHAREHOLDER WHO SO REQUESTS, A SUMMARY OF THE POWERS, DESIGNATIONS, PREFERENCES AND RELATIVE, PARTICIPATING, OPTIONAL OR OTHER SPECIAL RIGHTS OF EACH CLASS OF STOCK OF THE COMPANY AND THE QUALIFICATIONS, LIMITATIONS OR RESTRICTIONS OF SUCH PREFERENCES AND RIGHTS, AND THE VARIATIONS IN RIGHTS, PREFERENCES AND LIMITATIONS DETERMINED FOR EACH SERIES, WHICH ARE FIXED BY THE CERTIFICATE OF INCORPORATION OF THE COMPANY, AS AMENDED, AND THE RESOLUTIONS OF THE BOARD OF DIRECTORS OF THE COMPANY, AND THE AUTHORITY OF THE BOARD OF DIRECTORS TO DETERMINE VARIATIONS FOR FUTURE SERIES. SUCH REQUEST MAY BE MADE TO THE OFFICE OF THE SECRETARY OF THE COMPANY OR TO THE TRANSFER AGENT. THE BOARD OF DIRECTORS MAY REQUIRE THE OWNER OF A LOST OR DESTROYED STOCK CERTIFICATE, OR HIS LEGAL REPRESENTATIVES, TO GIVE THE COMPANY A BOND TO INDEMNIFY IT AND ITS TRANSFER AGENTS AND REGISTRARS AGAINST ANY CLAIM THAT MAY BE MADE AGAINST THEM ON ACCOUNT OF THE ALLEGED LOSS OR DESTRUCTION OF ANY SUCH CERTIFICATE.

The following abbreviations, when used in the inscription on the face of this certificate, shall be construed as though they were written out in full according to applicable laws or regulations:

TEN COM	- as tenants in common	UNIF GIFT MIN ACT	-.....(Cust).....Custodian.....(Minor).....
TEN ENT	- as tenants by the entireties		under Uniform Gifts to Minors Act.....(State).....
JT TEN	- as joint tenants with right of survivorship and not as tenants in common	UNIF TRF MIN ACT	-.....(Cust).....Custodian (until age.....)
			.....(Minor).....under Uniform Transfers to Minors Act.....(State).....

Additional abbreviations may also be used though not in the above list.

PLEASE INSERT SOCIAL SECURITY OR OTHER IDENTIFYING NUMBER OF ASSIGNEE

For value received, _____ hereby sell, assign and transfer unto

_____

(PLEASE PRINT OR TYPEWRITE NAME AND ADDRESS, INCLUDING POSTAL ZIP CODE, OF ASSIGNEE)

_____

_____

_____ Shares

of the common stock represented by the within Certificate, and do hereby irrevocably constitute and appoint

_____ Attorney

to transfer the said stock on the books of the within-named Company with full power of substitution in the premises.

Dated: _____ 20____

Signature: _____

Signature: _____

Notice: The signature to this assignment must correspond with the name as written upon the face of the certificate, in every particular, without alteration or enlargement, or any change whatever.

Signature(s) Guaranteed: Medallion Guarantee Stamp

THE SIGNATURE(S) SHOULD BE GUARANTEED BY AN ELIGIBLE GUARANTOR INSTITUTION (Banks, Stockbrokers, Savings and Loan Associations and Credit Unions) WITH MEMBERSHIP IN AN APPROVED SIGNATURE GUARANTEE MEDALLION PROGRAM, PURSUANT TO S.E.C. RULE 17Ad-15.

SECURITY INSTRUCTIONS

THIS IS WATERMARKED PAPER. DO NOT ACCEPT WITHOUT NOTING WATERMARK. HOLD TO LIGHT TO VERIFY WATERMARK.

The IRS requires that the named transfer agent ("we") report the cost basis of certain shares or units acquired after January 1, 2011. If your shares or units are covered by the legislation, and you requested to sell or transfer the shares or units using a specific cost basis calculation method, then we have processed as you requested. If you did not specify a cost basis calculation method, then we have defaulted to the first in, first out (FIFO) method. Please consult your tax advisor if you need additional information about cost basis.

If you do not keep in contact with the issuer or do not have any activity in your account for the time period specified by state law, your property may become subject to state unclaimed property laws and transferred to the appropriate state.

1234567

Exhibit 5.1

Cooley

Michael E. Tenta
+1 650 843 5636
mtenta@cooley.com

June 7, 2019

Personalis, Inc.
1330 O'Brien Drive
Menlo Park, CA 94025

Ladies and Gentlemen:

We have acted as counsel to Personalis, Inc., a Delaware corporation (the "***Company***"), in connection with the filing by the Company of a Registration Statement (No. 333-231703) on Form S-1 (the "***Registration Statement***") with the Securities and Exchange Commission, including a related prospectus filed with the Registration Statement (the "***Prospectus***"), covering an underwritten public offering of up to 7,666,667 shares of the Company's common stock, par value $0.0001 ("***Shares***"), including up to 1,000,000 Shares that may be sold by the Company upon exercise of an over-allotment option to be granted to the underwriters.

In connection with this opinion, we have (i) examined and relied upon (a) the Registration Statement and the Prospectus, (b) the Company's Amended and Restated Certificate of Incorporation, as amended, and Bylaws, each as currently in effect, (c) the forms of the Company's Amended and Restated Certificate of Incorporation and Amended and Restated Bylaws, filed as Exhibits 3.3 and 3.4 to the Registration Statement, respectively, each of which is to be in effect upon closing of the offering contemplated by the Registration Statement and (d) originals or copies certified to our satisfaction of such records, documents, certificates, memoranda and other instruments as in our judgment are necessary or appropriate to enable us to render the opinion expressed below and (ii) assumed the Board of Directors of the Company or a duly authorized committee thereof has taken action to set the sale price of the Shares. We have assumed the genuineness and authenticity of all documents submitted to us as originals, and the conformity to originals of all documents submitted to us as copies and the due execution and delivery of all documents where due execution and delivery are a prerequisite to the effectiveness thereof. As to certain factual matters, we have relied upon a certificate of an officer of the Company and have not sought independently to verify such matters.

Our opinion is expressed only with respect to the General Corporation Law of the State of Delaware. We express no opinion to the extent that any other laws are applicable to the subject matter hereof and express no opinion and provide no assurance as to compliance with any federal or state securities law, rule or regulation.

On the basis of the foregoing, and in reliance thereon, we are of the opinion that the Shares, when sold and issued against payment therefore as described in with the Registration Statement and the Prospectus, will be validly issued, fully paid and non-assessable.

We consent to the reference to our firm under the caption "Legal Matters" in the Prospectus included in the Registration Statement and to the filing of this opinion as an exhibit to the Registration Statement.

Sincerely,

Cooley LLP

By: /s/ Michael E. Tenta
Michael E. Tenta

PERSONALIS, INC.

2019 EQUITY INCENTIVE PLAN

ADOPTED BY THE BOARD OF DIRECTORS: MAY 23, 2019
AMENDED BY THE BOARD OF DIRECTORS: JUNE 2, 2019
APPROVED BY THE STOCKHOLDERS: JUNE 4, 2019
IPO DATE: , 2019

1. GENERAL.

(a) Successor to and Continuation of Prior Plan. The Plan is intended as the successor to and continuation of the Company's 2011 Equity Incentive Plan, as amended from time to time (the "***Prior Plan***"). From and after 12:01 a.m. Pacific time on the IPO Date, no additional awards will be granted under the Prior Plan. All Awards granted on or after 12:01 a.m. Pacific Time on the IPO Date will be granted under this Plan. All awards granted under the Prior Plan will remain subject to the terms of the Prior Plan.

(i) Any shares that would otherwise remain available for future grants under the Prior Plan as of 12:01 a.m. Pacific Time on the IPO Date (the "***Prior Plan's Available Reserve***") will cease to be available under the Prior Plan at such time. Instead, that number of shares of Common Stock equal to the Prior Plan's Available Reserve will be added to the Share Reserve (as further described in Section 3(a) below) and will be immediately available for grants and issuance pursuant to Stock Awards hereunder, up to the maximum number set forth in Section 3(a) below.

(ii) In addition, from and after 12:01 a.m. Pacific time on the IPO Date, any shares subject, at such time, to outstanding stock awards granted under the Prior Plan that (i) expire or terminate for any reason prior to exercise or settlement; (ii) are forfeited because of the failure to meet a contingency or condition required to vest such shares or otherwise return to the Company; or (iii) are reacquired, withheld (or not issued) to satisfy a tax withholding obligation in connection with an award or to satisfy the purchase price or exercise price of a stock award (such shares the "***Returning Shares***") will immediately be added to the Share Reserve (as further described in Section 3(a) below) as and when such shares become Returning Shares, up to the maximum number set forth in Section 3(a) below.

(b) Eligible Award Recipients. Employees, Directors and Consultants are eligible to receive Awards.

(c) Available Awards. The Plan provides for the grant of the following Awards: (i) Incentive Stock Options, (ii) Nonstatutory Stock Options, (iii) Stock Appreciation Rights, (iv) Restricted Stock Awards, (v) Restricted Stock Unit Awards, (vi) Performance Stock Awards, (vii) Performance Cash Awards, and (viii) Other Stock Awards.

(d) Purpose. The Plan, through the grant of Awards, is intended to help the Company secure and retain the services of eligible award recipients, provide incentives for such persons to exert maximum efforts for the success of the Company and any Affiliate, and provide a means by which the eligible recipients may benefit from increases in value of the Common Stock.

2. ADMINISTRATION.

(a) Administration by Board. The Board will administer the Plan. The Board may delegate administration of the Plan to a Committee or Committees, as provided in Section 2(c).

(b) Powers of Board. The Board will have the power, subject to, and within the limitations of, the express provisions of the Plan:

(i) To determine: (A) who will be granted Awards; (B) when and how each Award will be granted; (C) what type of Award will be granted; (D) the provisions of each Award (which need not be identical), including when a person will be permitted to exercise or otherwise receive cash or Common Stock under the Award; (E) the number of shares of Common Stock subject to, or the cash value of, an Award; and (F) the Fair Market Value applicable to a Stock Award.

(ii) To construe and interpret the Plan and Awards granted under it, and to establish, amend and revoke rules and regulations for administration of the Plan and Awards. The Board, in the exercise of these powers, may correct any defect, omission or inconsistency in the Plan or in any Award Agreement or in the written terms of a Performance Cash Award, in a manner and to the extent it will deem necessary or expedient to make the Plan or Award fully effective.

(iii) To settle all controversies regarding the Plan and Awards granted under it.

(iv) To accelerate, in whole or in part, the time at which an Award may be exercised or vest (or the time at which cash or shares of Common Stock may be issued in settlement thereof).

(v) To suspend or terminate the Plan at any time. Except as otherwise provided in the Plan or an Award Agreement, suspension or termination of the Plan will not materially impair a Participant's rights under the Participant's then-outstanding Award without the Participant's written consent, except as provided in subsection (viii) below.

(vi) To amend the Plan in any respect the Board deems necessary or advisable, including, without limitation, by adopting amendments relating to Incentive Stock Options and certain nonqualified deferred compensation under Section 409A of the Code and/or bringing the Plan or Awards granted under the Plan into compliance with the requirements for Incentive Stock Options or ensuring that they are exempt from, or compliant with, the requirements for nonqualified deferred compensation under Section 409A of the Code, subject to the limitations, if any, of applicable law. If required by applicable law or listing requirements, and except as provided in Section 9(a) relating to Capitalization Adjustments, the Company will seek stockholder approval of any amendment of the Plan that (A) materially increases the number of shares of Common Stock available for issuance under the Plan, (B) materially expands the class of individuals eligible to receive Awards under the Plan, (C) materially increases the benefits accruing to Participants under the Plan, (D) materially reduces the price at which shares of

Common Stock may be issued or purchased under the Plan, (E) materially extends the term of the Plan, or (F) materially expands the types of Awards available for issuance under the Plan. Except as otherwise provided in the Plan or an Award Agreement, no amendment of the Plan will materially impair a Participant's rights under an outstanding Award without the Participant's written consent.

(vii) To submit any amendment to the Plan for stockholder approval, including, but not limited to, amendments to the Plan intended to satisfy the requirements of (A) Section 422 of the Code regarding "incentive stock options" or (B) Rule 16b-3.

(viii) To approve forms of Award Agreements for use under the Plan and to amend the terms of any one or more Awards, including, but not limited to, amendments to provide terms more favorable to the Participant than previously provided in the Award Agreement, subject to any specified limits in the Plan that are not subject to Board discretion; *provided, however,* that a Participant's rights under any Award will not be impaired by any such amendment unless (A) the Company requests the consent of the affected Participant, and (B) such Participant consents in writing. Notwithstanding the foregoing, (1) a Participant's rights will not be deemed to have been impaired by any such amendment if the Board, in its sole discretion, determines that the amendment, taken as a whole, does not materially impair the Participant's rights, and (2) subject to the limitations of applicable law, if any, the Board may amend the terms of any one or more Awards without the affected Participant's consent (A) to maintain the qualified status of the Award as an Incentive Stock Option under Section 422 of the Code; (B) to change the terms of an Incentive Stock Option, if such change results in impairment of the Award solely because it impairs the qualified status of the Award as an Incentive Stock Option under Section 422 of the Code; (C) to clarify the manner of exemption from, or to bring the Award into compliance with, Section 409A of the Code; or (D) to comply with other applicable laws or listing requirements.

(ix) Generally, to exercise such powers and to perform such acts as the Board deems necessary or expedient to promote the best interests of the Company and that are not in conflict with the provisions of the Plan or Awards.

(x) To adopt such procedures and sub-plans as are necessary or appropriate to permit participation in the Plan by Employees, Directors or Consultants who are foreign nationals or employed outside the United States (provided that Board approval will not be necessary for immaterial modifications to the Plan or any Award Agreement that are required for compliance with the laws of the relevant foreign jurisdiction).

(xi) To effect, with the consent of any adversely affected Participant, (A) the reduction of the exercise, purchase or strike price of any outstanding Stock Award; (B) the cancellation of any outstanding Stock Award and the grant in substitution therefor of a new (1) Option or SAR, (2) Restricted Stock Award, (3) Restricted Stock Unit Award, (4) Other Stock Award, (5) cash and/or (6) other valuable consideration determined by the Board, in its sole discretion, with any such substituted award (x) covering the same or a different number of shares of Common Stock as the cancelled Stock Award and (y) granted under the Plan or another equity or compensatory plan of the Company; or (C) any other action that is treated as a repricing under generally accepted accounting principles.

(c) Delegation to Committee.

(i) General. The Board may delegate some or all of the administration of the Plan to a Committee or Committees. If administration of the Plan is delegated to a Committee, the Committee will have, in connection with the administration of the Plan, the powers theretofore possessed by the Board that have been delegated to the Committee, including the power to delegate to a subcommittee of the Committee any of the administrative powers the Committee is authorized to exercise (and references in this Plan to the Board will thereafter be construed as being to the Committee or subcommittee, as applicable). Any delegation of administrative powers will be reflected in resolutions, not inconsistent with the provisions of the Plan, adopted from time to time by the Board or Committee (as applicable). The Board may retain the authority to concurrently administer the Plan with the Committee and may, at any time, revest in the Board some or all of the powers previously delegated.

(ii) Rule 16b-3 Compliance. The Committee may consist solely of two or more Non-Employee Directors in accordance with Rule 16b-3.

(d) Delegation to an Officer. The Board may delegate to one (1) or more Officers the authority to do one or both of the following (i) designate Employees who are not Officers to be recipients of Options and SARs (and, to the extent permitted by applicable law, other Stock Awards) and, to the extent permitted by applicable law, the terms of such Awards, and (ii) determine the number of shares of Common Stock to be subject to such Stock Awards granted to such Employees; *provided*, *however*, that the Board resolutions regarding such delegation will specify the total number of shares of Common Stock that may be subject to the Stock Awards granted by such Officer and that such Officer may not grant a Stock Award to himself or herself. Any such Stock Awards will be granted on the form of Stock Award Agreement most recently approved for use by the Committee or the Board, unless otherwise provided in the resolutions approving the delegation authority. The Board may not delegate authority to an Officer who is acting solely in the capacity of an Officer (and not also as a Director) to determine the Fair Market Value pursuant to Section 13(w)(iii) below.

(e) Effect of Board's Decision. All determinations, interpretations and constructions made by the Board in good faith will not be subject to review by any person and will be final, binding and conclusive on all persons.

3. SHARES SUBJECT TO THE PLAN.

(a) Share Reserve. Subject to Section 9(a) relating to Capitalization Adjustments, and the following sentence regarding the annual increase, the aggregate number of shares of Common Stock that may be issued pursuant to Stock Awards will not exceed 7,440,524 shares (the "***Share Reserve***"), which number is the sum of (i) 2,000,000 new shares, *plus* (ii) the number of shares subject to the Prior Plan's Available Reserve, *plus* (iii) the number of shares that are Returning Shares, as such shares become available from time to time.

In addition, the Share Reserve will automatically increase on January 1st of each year, for a period of not more than ten years, commencing on January 1st of the year following the year in which the IPO Date occurs and ending on (and including) January 1, 2029, in an amount equal to

5% of the total number of shares of Capital Stock outstanding on December 31st of the preceding calendar year. Notwithstanding the foregoing, the Board may act prior to January 1st of a given year to provide that there will be no January 1st increase in the Share Reserve for such year or that the increase in the Share Reserve for such year will be a lesser number of shares of Common Stock than would otherwise occur pursuant to the preceding sentence.

For clarity, the Share Reserve in this Section 3(a) is a limitation on the number of shares of Common Stock that may be issued pursuant to the Plan. Accordingly, this Section 3(a) does not limit the granting of Stock Awards except as provided in Section 7(a). Shares may be issued in connection with a merger or acquisition as permitted by Nasdaq Listing Rule 5635(c) or, if applicable, NYSE Listed Company Manual Section 303A.08, AMEX Company Guide Section 711 or other applicable rule, and such issuance will not reduce the number of shares available for issuance under the Plan.

(b) Reversion of Shares to the Share Reserve. If a Stock Award or any portion thereof (i) expires or otherwise terminates without all of the shares covered by such Stock Award having been issued or (ii) is settled in cash (*i.e.*, the Participant receives cash rather than stock), such expiration, termination or settlement will not reduce (or otherwise offset) the number of shares of Common Stock that may be available for issuance under the Plan. If any shares of Common Stock issued pursuant to a Stock Award are forfeited back to or repurchased by the Company because of the failure to meet a contingency or condition required to vest such shares in the Participant, then the shares that are forfeited or repurchased will revert to and again become available for issuance under the Plan. Any shares reacquired by the Company in satisfaction of tax withholding obligations on a Stock Award or as consideration for the exercise or purchase price of a Stock Award will again become available for issuance under the Plan.

(c) Incentive Stock Option Limit. Subject to the provisions of Section 9(a) relating to Capitalization Adjustments, the aggregate maximum number of shares of Common Stock that may be issued pursuant to the exercise of Incentive Stock Options will be three times the Share Reserve.

(d) Limitation on Grants to Non-Employee Directors. The maximum number of shares of Common Stock subject to Stock Awards granted under the Plan or otherwise during any one calendar year to any Non-Employee Director, taken together with any cash fees paid by the Company to such Non-Employee Director during such calendar year for service on the Board, will not exceed $750,000 in total value (calculating the value of any such Stock Awards based on the grant date fair value of such Stock Awards for financial reporting purposes), or, with respect to the calendar year in which a Non-Employee Director is first appointed or elected to the Board, $900,000.

(e) Source of Shares. The stock issuable under the Plan will be shares of authorized but unissued or reacquired Common Stock, including shares repurchased by the Company on the open market or otherwise.

4. ELIGIBILITY.

(a) Eligibility for Specific Stock Awards. Incentive Stock Options may be granted only to employees of the Company or a "parent corporation" or "subsidiary corporation" thereof (as such terms are defined in Sections 424(e) and 424(f) of the Code). Stock Awards other than Incentive Stock Options may be granted to Employees, Directors and Consultants; *provided*, *however*, that Stock Awards may not be granted to Employees, Directors and Consultants who are providing Continuous Service only to any "parent" of the Company, as such term is defined in Rule 405 of the Securities Act, unless (i) the stock underlying such Stock Awards is treated as "service recipient stock" under Section 409A of the Code (for example, because the Stock Awards are granted pursuant to a corporate transaction such as a spin off transaction), (ii) the Company, in consultation with its legal counsel, has determined that such Stock Awards are otherwise exempt from Section 409A of the Code, or (iii) the Company, in consultation with its legal counsel, has determined that such Stock Awards comply with the distribution requirements of Section 409A of the Code.

(b) Ten Percent Stockholders. A Ten Percent Stockholder will not be granted an Incentive Stock Option unless the exercise price of such Option is at least 110% of the Fair Market Value on the date of grant and the Option is not exercisable after the expiration of five years from the date of grant.

5. PROVISIONS RELATING TO OPTIONS AND STOCK APPRECIATION RIGHTS.

Each Option or SAR will be in such form and will contain such terms and conditions as the Board deems appropriate. All Options will be separately designated Incentive Stock Options or Nonstatutory Stock Options at the time of grant, and, if certificates are issued, a separate certificate or certificates will be issued for shares of Common Stock purchased on exercise of each type of Option. If an Option is not specifically designated as an Incentive Stock Option, or if an Option is designated as an Incentive Stock Option but some portion or all of the Option fails to qualify as an Incentive Stock Option under the applicable rules, then the Option (or portion thereof) will be a Nonstatutory Stock Option. The provisions of separate Options or SARs need not be identical; *provided, however*, that each Award Agreement will conform to (through incorporation of provisions hereof by reference in the applicable Award Agreement or otherwise) the substance of each of the following provisions:

(a) Term. Subject to the provisions of Section 4(b) regarding Ten Percent Stockholders, no Option or SAR will be exercisable after the expiration of ten years from the date of its grant or such shorter period specified in the Award Agreement.

(b) Exercise Price. Subject to the provisions of Section 4(b) regarding Ten Percent Stockholders, the exercise or strike price of each Option or SAR will be not less than 100% of the Fair Market Value of the Common Stock subject to the Option or SAR on the date the Award is granted. Notwithstanding the foregoing, an Option or SAR may be granted with an exercise or strike price lower than 100% of the Fair Market Value of the Common Stock subject to the Award if such Award is granted pursuant to an assumption of or substitution for another option or stock appreciation right pursuant to a Corporate Transaction and in a manner consistent with the provisions of Section 409A of the Code and, if applicable, Section 424(a) of the Code. Each SAR will be denominated in shares of Common Stock equivalents.

(c) Purchase Price for Options. The purchase price of Common Stock acquired pursuant to the exercise of an Option may be paid, to the extent permitted by applicable law and as determined by the Board in its sole discretion, by any combination of the methods of payment set forth below. The Board will have the authority to grant Options that do not permit all of the following methods of payment (or otherwise restrict the ability to use certain methods) and to grant Options that require the consent of the Company to use a particular method of payment. The permitted methods of payment are as follows:

(i) by cash, check, bank draft or money order payable to the Company;

(ii) pursuant to a program developed under Regulation T as promulgated by the Federal Reserve Board that, prior to the issuance of the stock subject to the Option, results in either the receipt of cash (or check) by the Company or the receipt of irrevocable instructions to pay the aggregate exercise price to the Company from the sales proceeds;

(iii) by delivery to the Company (either by actual delivery or attestation) of shares of Common Stock;

(iv) if an Option is a Nonstatutory Stock Option, by a "net exercise" arrangement pursuant to which the Company will reduce the number of shares of Common Stock issuable upon exercise by the largest whole number of shares with a Fair Market Value that does not exceed the aggregate exercise price; *provided, however*, that the Company will accept a cash or other payment from the Participant to the extent of any remaining balance of the aggregate exercise price not satisfied by such reduction in the number of whole shares to be issued. Shares of Common Stock will no longer be subject to an Option and will not be exercisable thereafter to the extent that (A) shares issuable upon exercise are used to pay the exercise price pursuant to the "net exercise," (B) shares are delivered to the Participant as a result of such exercise, and (C) shares are withheld to satisfy tax withholding obligations; or

(v) in any other form of legal consideration that may be acceptable to the Board and specified in the applicable Award Agreement.

(d) Exercise and Payment of a SAR. To exercise any outstanding SAR, the Participant must provide written notice of exercise to the Company in compliance with the provisions of the Stock Appreciation Right Agreement evidencing such SAR. The appreciation distribution payable on the exercise of a SAR will be not greater than an amount equal to the excess of (A) the aggregate Fair Market Value (on the date of the exercise of the SAR) of a number of shares of Common Stock equal to the number of Common Stock equivalents in which the Participant is vested under such SAR, and with respect to which the Participant is exercising the SAR on such date, over (B) the aggregate strike price of the number of Common Stock equivalents with respect to which the Participant is exercising the SAR on such date. The appreciation distribution may be paid in Common Stock, in cash, in any combination of the two or in any other form of consideration, as determined by the Board and contained in the Award Agreement evidencing such SAR.

(e) Transferability of Options and SARs. The Board may, in its sole discretion, impose such limitations on the transferability of Options and SARs as the Board will determine. In the absence of such a determination by the Board to the contrary, the following restrictions on the transferability of Options and SARs will apply:

(i) Restrictions on Transfer. An Option or SAR will not be transferable except by will or by the laws of descent and distribution (or pursuant to subsections (ii) and (iii) below), and will be exercisable during the lifetime of the Participant only by the Participant. The Board may permit transfer of the Option or SAR in a manner that is not prohibited by applicable tax and securities laws. Except as explicitly provided in the Plan, neither an Option nor a SAR may be transferred for consideration.

(ii) Domestic Relations Orders. Subject to the approval of the Board or a duly authorized Officer, an Option or SAR may be transferred pursuant to the terms of a domestic relations order, official marital settlement agreement or other divorce or separation instrument as permitted by Treasury Regulations Section 1.421-1(b)(2). If an Option is an Incentive Stock Option, such Option may be deemed to be a Nonstatutory Stock Option as a result of such transfer.

(iii) Beneficiary Designation. Subject to the approval of the Board or a duly authorized Officer, a Participant may, by delivering written notice to the Company, in a form approved by the Company (or the designated broker), designate a third party who, on the death of the Participant, will thereafter be entitled to exercise the Option or SAR and receive the Common Stock or other consideration resulting from such exercise. In the absence of such a designation, upon the death of the Participant, the executor or administrator of the Participant's estate will be entitled to exercise the Option or SAR and receive the Common Stock or other consideration resulting from such exercise. However, the Company may prohibit designation of a beneficiary at any time, including due to any conclusion by the Company that such designation would be inconsistent with the provisions of applicable laws.

(f) Vesting Generally. The total number of shares of Common Stock subject to an Option or SAR may vest and become exercisable in periodic installments that may or may not be equal. The Option or SAR may be subject to such other terms and conditions on the time or times when it may or may not be exercised (which may be based on the satisfaction of Performance Goals or other criteria) as the Board may deem appropriate. The vesting provisions of individual Options or SARs may vary. The provisions of this Section 5(f) are subject to any Option or SAR provisions governing the minimum number of shares of Common Stock as to which an Option or SAR may be exercised.

(g) Termination of Continuous Service. Except as otherwise provided in the applicable Award Agreement or other agreement between the Participant and the Company, if a Participant's Continuous Service terminates (other than for Cause and other than upon the Participant's death or Disability), the Participant may exercise his or her Option or SAR (to the extent that the Participant was entitled to exercise such Award as of the date of termination of Continuous Service) within the period of time ending on the earlier of (i) the date that is 90 days following the termination of the Participant's Continuous Service (or such longer or shorter period specified in the applicable Award Agreement), and (ii) the expiration of the term of the

Option or SAR as set forth in the Award Agreement. If, after termination of Continuous Service, the Participant does not exercise his or her Option or SAR (as applicable) within the applicable time frame, the Option or SAR will terminate.

(h) Extension of Termination Date. If the exercise of an Option or SAR following the termination of the Participant's Continuous Service (other than for Cause and other than upon the Participant's death or Disability) would be prohibited at any time solely because the issuance of shares of Common Stock would violate the registration requirements under the Securities Act, then the Option or SAR will terminate on the earlier of (i) the expiration of a total period of time (that need not be consecutive) equal to the applicable post termination exercise period after the termination of the Participant's Continuous Service during which the exercise of the Option or SAR would not be in violation of such registration requirements, and (ii) the expiration of the term of the Option or SAR as set forth in the applicable Award Agreement. In addition, unless otherwise provided in a Participant's Award Agreement, if the sale of any Common Stock received on exercise of an Option or SAR following the termination of the Participant's Continuous Service (other than for Cause) would violate the Company's insider trading policy, then the Option or SAR will terminate on the earlier of (i) the expiration of a period of months (that need not be consecutive) equal to the applicable post-termination exercise period after the termination of the Participant's Continuous Service during which the sale of the Common Stock received upon exercise of the Option or SAR would not be in violation of the Company's insider trading policy, or (ii) the expiration of the term of the Option or SAR as set forth in the applicable Award Agreement.

(i) Disability of Participant. Except as otherwise provided in the applicable Award Agreement or other agreement between the Participant and the Company, if a Participant's Continuous Service terminates as a result of the Participant's Disability, the Participant may exercise his or her Option or SAR (to the extent that the Participant was entitled to exercise such Option or SAR as of the date of termination of Continuous Service), but only within such period of time ending on the earlier of (i) the date 12 months following such termination of Continuous Service (or such longer or shorter period specified in the Award Agreement), and (ii) the expiration of the term of the Option or SAR as set forth in the Award Agreement. If, after termination of Continuous Service, the Participant does not exercise his or her Option or SAR within the applicable time frame, the Option or SAR (as applicable) will terminate.

(j) Death of Participant. Except as otherwise provided in the applicable Award Agreement or other agreement between the Participant and the Company, if (i) a Participant's Continuous Service terminates as a result of the Participant's death, or (ii) the Participant dies within the period (if any) specified in the Award Agreement for exercisability after the termination of the Participant's Continuous Service for a reason other than death, then the Option or SAR may be exercised (to the extent the Participant was entitled to exercise such Option or SAR as of the date of death) by the Participant's estate, by a person who acquired the right to exercise the Option or SAR by bequest or inheritance or by a person designated to exercise the Option or SAR upon the Participant's death, but only within the period ending on the earlier of (i) the date 18 months following the date of death (or such longer or shorter period specified in the Award Agreement), and (ii) the expiration of the term of such Option or SAR as set forth in the Award Agreement. If, after the Participant's death, the Option or SAR is not exercised within the applicable time frame, the Option or SAR (as applicable) will terminate.

(k) Termination for Cause. Except as explicitly provided otherwise in a Participant's Award Agreement or other individual written agreement between the Company and the Participant, if a Participant's Continuous Service is terminated for Cause, the Option or SAR will terminate immediately upon such Participant's termination of Continuous Service, and the Participant will be prohibited from exercising his or her Option or SAR from and after the time of such termination of Continuous Service.

(l) Non-Exempt Employees. If an Option or SAR is granted to an Employee who is a non-exempt employee for purposes of the Fair Labor Standards Act of 1938, as amended, the Option or SAR will not be first exercisable for any shares of Common Stock until at least six months following the date of grant of the Option or SAR (although the Award may vest prior to such date). Consistent with the provisions of the Worker Economic Opportunity Act, (i) if such non-exempt Employee dies or suffers a Disability, (ii) upon a Corporate Transaction in which such Option or SAR is not assumed, continued, or substituted, (iii) upon a Change in Control, or (iv) upon the Participant's retirement (as such term may be defined in the Participant's Award Agreement in another agreement between the Participant and the Company, or, if no such definition, in accordance with the Company's then current employment policies and guidelines), the vested portion of any Options and SARs may be exercised earlier than six months following the date of grant. The foregoing provision is intended to operate so that any income derived by a non-exempt employee in connection with the exercise or vesting of an Option or SAR will be exempt from his or her regular rate of pay. To the extent permitted and/or required for compliance with the Worker Economic Opportunity Act to ensure that any income derived by a non-exempt employee in connection with the exercise, vesting or issuance of any shares under any other Stock Award will be exempt from the employee's regular rate of pay, the provisions of this Section 5(l) will apply to all Stock Awards and are hereby incorporated by reference into such Stock Award Agreements.

6. PROVISIONS OF STOCK AWARDS OTHER THAN OPTIONS AND SARS.

(a) Restricted Stock Awards. Each Restricted Stock Award Agreement will be in such form and will contain such terms and conditions as the Board will deem appropriate. To the extent consistent with the Company's bylaws, at the Board's election, shares of Common Stock may be (x) held in book entry form subject to the Company's instructions until any restrictions relating to the Restricted Stock Award lapse; or (y) evidenced by a certificate, which certificate will be held in such form and manner as determined by the Board. The terms and conditions of Restricted Stock Award Agreements may change from time to time, and the terms and conditions of separate Restricted Stock Award Agreements need not be identical. Each Restricted Stock Award Agreement will conform to (through incorporation of the provisions hereof by reference in the agreement or otherwise) the substance of each of the following provisions:

(i) Consideration. A Restricted Stock Award may be awarded in consideration for (A) cash, check, bank draft or money order payable to the Company, (B) past or future services to the Company or an Affiliate, or (C) any other form of legal consideration that may be acceptable to the Board, in its sole discretion, and permissible under applicable law.

(ii) Vesting. Shares of Common Stock awarded under the Restricted Stock Award Agreement may be subject to forfeiture to the Company in accordance with a vesting schedule to be determined by the Board.

(iii) Termination of Participant's Continuous Service. If a Participant's Continuous Service terminates, the Company may receive through a forfeiture condition or a repurchase right any or all of the shares of Common Stock held by the Participant that have not vested as of the date of termination of Continuous Service under the terms of the Restricted Stock Award Agreement.

(iv) Transferability. Rights to acquire shares of Common Stock under the Restricted Stock Award Agreement will be transferable by the Participant only upon such terms and conditions as are set forth in the Restricted Stock Award Agreement, as the Board will determine in its sole discretion, so long as Common Stock awarded under the Restricted Stock Award Agreement remains subject to the terms of the Restricted Stock Award Agreement.

(v) Dividends. A Restricted Stock Award Agreement may provide that any dividends paid on Restricted Stock will be subject to the same vesting and forfeiture restrictions as apply to the shares subject to the Restricted Stock Award to which they relate.

(b) Restricted Stock Unit Awards. Each Restricted Stock Unit Award Agreement will be in such form and will contain such terms and conditions as the Board will deem appropriate. The terms and conditions of Restricted Stock Unit Award Agreements may change from time to time, and the terms and conditions of separate Restricted Stock Unit Award Agreements need not be identical. Each Restricted Stock Unit Award Agreement will conform to (through incorporation of the provisions hereof by reference in the Agreement or otherwise) the substance of each of the following provisions:

(i) Consideration. At the time of grant of a Restricted Stock Unit Award, the Board will determine the consideration, if any, to be paid by the Participant upon delivery of each share of Common Stock subject to the Restricted Stock Unit Award. The consideration to be paid (if any) by the Participant for each share of Common Stock subject to a Restricted Stock Unit Award may be paid in any form of legal consideration that may be acceptable to the Board, in its sole discretion, and permissible under applicable law.

(ii) Vesting. At the time of the grant of a Restricted Stock Unit Award, the Board may impose such restrictions on or conditions to the vesting of the Restricted Stock Unit Award as it, in its sole discretion, deems appropriate.

(iii) Payment. A Restricted Stock Unit Award may be settled by the delivery of shares of Common Stock, their cash equivalent, any combination thereof or in any other form of consideration, as determined by the Board and contained in the Restricted Stock Unit Award Agreement.

(iv) Additional Restrictions. At the time of the grant of a Restricted Stock Unit Award, the Board, as it deems appropriate, may impose such restrictions or conditions that delay the delivery of the shares of Common Stock (or their cash equivalent) subject to a Restricted Stock Unit Award to a time after the vesting of such Restricted Stock Unit Award.

(v) Dividend Equivalents. Dividend equivalents may be credited in respect of shares of Common Stock covered by a Restricted Stock Unit Award, as determined by the Board and contained in the Restricted Stock Unit Award Agreement. At the sole discretion of the Board, such dividend equivalents may be converted into additional shares of Common Stock covered by the Restricted Stock Unit Award in such manner as determined by the Board. Any additional shares covered by the Restricted Stock Unit Award credited by reason of such dividend equivalents will be subject to all of the same terms and conditions of the underlying Restricted Stock Unit Award Agreement to which they relate.

(vi) Termination of Participant's Continuous Service. Except as otherwise provided in the applicable Restricted Stock Unit Award Agreement, such portion of the Restricted Stock Unit Award that has not vested will be forfeited upon the Participant's termination of Continuous Service.

(c) Performance Awards.

(i) Performance Stock Awards. A Performance Stock Award is a Stock Award that is payable (including that may be granted, may vest or may be exercised) contingent upon the attainment during a Performance Period of certain Performance Goals. A Performance Stock Award may, but need not, require the Participant's completion of a specified period of Continuous Service. The length of any Performance Period, the Performance Goals to be achieved during the Performance Period, and the measure of whether and to what degree such Performance Goals have been attained will be conclusively determined by the Board or Committee, in its sole discretion. In addition, to the extent permitted by applicable law and the applicable Award Agreement, the Board (or Committee, as the case may be) may determine that cash may be used in payment of Performance Stock Awards.

(ii) Performance Cash Awards. A Performance Cash Award is a cash award that is payable contingent upon the attainment during a Performance Period of certain Performance Goals. A Performance Cash Award may also require the completion of a specified period of Continuous Service. At the time of grant of a Performance Cash Award, the length of any Performance Period, the Performance Goals to be achieved during the Performance Period, and the measure of whether and to what degree such Performance Goals have been attained will be conclusively determined by the Board or Committee, in its sole discretion. The Board (or Committee, as the case may be) may specify the form of payment of Performance Cash Awards, which may be cash or other property, or may provide for a Participant to have the option for his or her Performance Cash Award, or such portion thereof as the Board (or Committee, as the case may be) may specify, to be paid in whole or in part in cash or other property.

(iii) Board Discretion. The Board (or Committee, as the case may be) retains the discretion to adjust or eliminate the compensation or economic benefit due upon attainment of Performance Goals and to define the manner of calculating the Performance Criteria it selects to use for a Performance Period. Partial achievement of the specified criteria may result in the payment or vesting corresponding to the degree of achievement as specified in the Stock Award Agreement or the written terms of a Performance Cash Award.

(d) Other Stock Awards. Other forms of Stock Awards valued in whole or in part by reference to, or otherwise based on, Common Stock, including the appreciation in value thereof (e.g., options or stock rights with an exercise price or strike price less than 100% of the Fair Market Value of the Common Stock at the time of grant) may be granted either alone or in addition to Stock Awards provided for under Section 5 and the preceding provisions of this Section 6. Subject to the provisions of the Plan, the Board will have sole and complete authority to determine the persons to whom and the time or times at which such Other Stock Awards will be granted, the number of shares of Common Stock (or the cash equivalent thereof) to be granted pursuant to such Other Stock Awards and all other terms and conditions of such Other Stock Awards.

7. COVENANTS OF THE COMPANY.

(a) Availability of Shares. The Company will keep available at all times the number of shares of Common Stock reasonably required to satisfy then-outstanding Awards.

(b) Securities Law Compliance. The Company will seek to obtain from each regulatory commission or agency, as necessary, such authority as may be required to grant Stock Awards and to issue and sell shares of Common Stock upon exercise or vesting of the Stock Awards; *provided, however*, that this undertaking will not require the Company to register under the Securities Act or other securities or applicable laws, the Plan, any Stock Award or any Common Stock issued or issuable pursuant to any such Stock Award. If, after reasonable efforts and at a reasonable cost, the Company is unable to obtain from any such regulatory commission or agency the authority that counsel for the Company deems necessary or advisable for the lawful issuance and sale of Common Stock under the Plan, the Company will be relieved from any liability for failure to issue and sell Common Stock upon exercise or vesting of such Stock Awards unless and until such authority is obtained. A Participant will not be eligible for the grant of an Award or the subsequent issuance of cash or Common Stock pursuant to the Award if such grant or issuance would be in violation of any applicable law.

(c) No Obligation to Notify or Minimize Taxes. The Company will have no duty or obligation to any Participant to advise such holder as to the tax treatment or time or manner of exercising such Stock Award. Furthermore, the Company will have no duty or obligation to warn or otherwise advise such holder of a pending termination or expiration of an Award or a possible period in which the Award may not be exercised. The Company has no duty or obligation to minimize the tax consequences of an Award to the holder of such Award.

8. MISCELLANEOUS.

(a) Use of Proceeds from Sales of Common Stock. Proceeds from the sale of shares of Common Stock pursuant to Awards will constitute general funds of the Company.

(b) Corporate Action Constituting Grant of Awards. Corporate action constituting a grant by the Company of an Award to any Participant will be deemed completed as of the date of such corporate action, unless otherwise determined by the Board, regardless of when the instrument, certificate, or letter evidencing the Award is communicated to, or actually received or accepted by, the Participant. In the event that the corporate records (e.g., Board

consents, resolutions or minutes) documenting the corporate action constituting the grant contain terms (e.g., exercise price, vesting schedule or number of shares) that are inconsistent with those in the Award Agreement or related grant documents as a result of a clerical error in the papering of the Award Agreement or related grant documents, the corporate records will control and the Participant will have no legally binding right to the incorrect term in the Award Agreement or related grant documents.

(c) Stockholder Rights. No Participant will be deemed to be the holder of, or to have any of the rights of a holder with respect to, any shares of Common Stock subject to an Award unless and until (i) such Participant has satisfied all requirements for exercise of, or the issuance of shares of Common Stock under, the Award pursuant to its terms, and (ii) the issuance of the Common Stock subject to such Award has been entered into the books and records of the Company.

(d) No Employment or Other Service Rights. Nothing in the Plan, any Award Agreement or any other instrument executed thereunder or in connection with any Award granted pursuant thereto will confer upon any Participant any right to continue to serve the Company or an Affiliate in the capacity in effect at the time the Award was granted or will affect the right of the Company or an Affiliate to terminate (i) the employment of an Employee with or without notice and with or without cause, (ii) the service of a Consultant pursuant to the terms of such Consultant's agreement with the Company or an Affiliate, or (iii) the service of a Director pursuant to the bylaws of the Company or an Affiliate, and any applicable provisions of the corporate law of the state or foreign jurisdiction in which the Company or the Affiliate is domiciled or incorporated, as the case may be.

(e) Change in Time Commitment. In the event a Participant's regular level of time commitment in the performance of his or her services for the Company and any Affiliates is reduced (for example, and without limitation, if the Participant is an Employee of the Company and the Employee has a change in status from a full-time Employee to a part-time Employee or takes an extended leave of absence) after the date of grant of any Award to the Participant, the Board has the right in its sole discretion to (x) make a corresponding reduction in the number of shares or cash amount subject to any portion of such Award that is scheduled to vest or become payable after the date of such change in time commitment, and (y) in lieu of or in combination with such a reduction, extend the vesting or payment schedule applicable to such Award. In the event of any such reduction, the Participant will have no right with respect to any portion of the Award that is so reduced or extended.

(f) Incentive Stock Option Limitations. To the extent that the aggregate Fair Market Value (determined at the time of grant) of Common Stock with respect to which Incentive Stock Options are exercisable for the first time by any Optionholder during any calendar year (under all plans of the Company and any Affiliates) exceeds $100,000 (or such other limit established in the Code) or otherwise does not comply with the rules governing Incentive Stock Options, the Options or portions thereof that exceed such limit (according to the order in which they were granted) or otherwise do not comply with such rules will be treated as Nonstatutory Stock Options, notwithstanding any contrary provision of the applicable Option Agreement(s).

(g) Investment Assurances. The Company may require a Participant, as a condition of exercising or acquiring Common Stock under any Award, (i) to give written assurances satisfactory to the Company as to the Participant's knowledge and experience in financial and business matters and/or to employ a purchaser representative reasonably satisfactory to the Company who is knowledgeable and experienced in financial and business matters and that such Participant is capable of evaluating, alone or together with the purchaser representative, the merits and risks of exercising the Award; and (ii) to give written assurances satisfactory to the Company stating that the Participant is acquiring Common Stock subject to the Award for the Participant's own account and not with any present intention of selling or otherwise distributing the Common Stock. The foregoing requirements, and any assurances given pursuant to such requirements, will be inoperative if (A) the issuance of the shares upon the exercise or acquisition of Common Stock under the Award has been registered under a then currently effective registration statement under the Securities Act, or (B) as to any particular requirement, a determination is made by counsel for the Company that such requirement need not be met in the circumstances under the then applicable securities laws. The Company may, upon advice of counsel to the Company, place legends on stock certificates issued under the Plan as such counsel deems necessary or appropriate in order to comply with applicable securities laws, including, but not limited to, legends restricting the transfer of the Common Stock.

(h) Withholding Obligations. Unless prohibited by the terms of an Award Agreement, the Company may, in its sole discretion, satisfy any federal, state or local tax withholding obligation relating to an Award by any of the following means or by a combination of such means: (i) causing the Participant to tender a cash payment; (ii) withholding shares of Common Stock from the shares of Common Stock issued or otherwise issuable to the Participant in connection with the Award; *provided, however,* that no shares of Common Stock are withheld with a value exceeding the maximum amount of tax required to be withheld by law (or such lesser amount as may be necessary to avoid classification of the Stock Award as a liability for financial accounting purposes); (iii) withholding cash from an Award settled in cash; (iv) withholding payment from any amounts otherwise payable to the Participant; or (v) by such other method as may be set forth in the Award Agreement.

(i) Electronic Delivery. Any reference herein to a "written" agreement or document will include any agreement or document delivered electronically, filed publicly at www.sec.gov (or any successor website thereto) or posted on the Company's intranet (or other shared electronic medium controlled by the Company to which the Participant has access).

(j) Deferrals. To the extent permitted by applicable law, the Board, in its sole discretion, may determine that the delivery of Common Stock or the payment of cash, upon the exercise, vesting or settlement of all or a portion of any Award may be deferred and may establish programs and procedures for deferral elections to be made by Participants. Deferrals by Participants will be made in accordance with Section 409A of the Code. Consistent with Section 409A of the Code, the Board may provide for distributions while a Participant is still an employee or otherwise providing services to the Company. The Board is authorized to make deferrals of Awards and determine when, and in what annual percentages, Participants may receive payments, including lump sum payments, following the Participant's termination of Continuous Service, and implement such other terms and conditions consistent with the provisions of the Plan and in accordance with applicable law.

(k) Compliance with Section 409A of the Code. Unless otherwise expressly provided for in an Award Agreement, the Plan and Award Agreements will be interpreted to the greatest extent possible in a manner that makes the Plan and the Awards granted hereunder exempt from Section 409A of the Code, and, to the extent not so exempt, in compliance with Section 409A of the Code. If the Board determines that any Award granted hereunder is not exempt from and is therefore subject to Section 409A of the Code, the Award Agreement evidencing such Award will incorporate the terms and conditions necessary to avoid the consequences specified in Section 409A(a)(1) of the Code, and to the extent an Award Agreement is silent on terms necessary for compliance, such terms are hereby incorporated by reference into the Award Agreement. Notwithstanding anything to the contrary in this Plan (and unless the Award Agreement specifically provides otherwise), if the shares of Common Stock are publicly traded, and if a Participant holding an Award that constitutes "deferred compensation" under Section 409A of the Code is a "specified employee" for purposes of Section 409A of the Code, no distribution or payment of any amount that is due because of a "separation from service" (as defined in Section 409A of the Code without regard to alternative definitions thereunder) will be issued or paid before the date that is six months following the date of such Participant's "separation from service" (as defined in Section 409A of the Code without regard to alternative definitions thereunder) or, if earlier, the date of the Participant's death, unless such distribution or payment can be made in a manner that complies with Section 409A of the Code, and any amounts so deferred will be paid in a lump sum on the day after such six month period elapses, with the balance paid thereafter on the original schedule.

(l) Clawback/Recovery. All Awards granted under the Plan will be subject to recoupment in accordance with any clawback policy that the Company is required to adopt pursuant to the listing standards of any national securities exchange or association on which the Company's securities are listed or as is otherwise required by the Dodd-Frank Wall Street Reform and Consumer Protection Act or other applicable law. In addition, the Board may impose such other clawback, recovery or recoupment provisions in an Award Agreement as the Board determines necessary or appropriate, including but not limited to a reacquisition right in respect of previously acquired shares of Common Stock or other cash or property upon the occurrence of an event constituting Cause. No recovery of compensation under such a clawback policy will be an event giving rise to a right to resign for "good reason" or "constructive termination" (or similar term) under any agreement with the Company.

9. ADJUSTMENTS UPON CHANGES IN COMMON STOCK; OTHER CORPORATE EVENTS.

(a) Capitalization Adjustments. In the event of a Capitalization Adjustment, the Board will appropriately and proportionately adjust: (i) the class(es) and maximum number of securities subject to the Plan pursuant to Section 3(a), (ii) the class(es) of securities by which the share reserve is to increase automatically each year pursuant to Section 3(a), (iii) the class(es) and maximum number of securities that may be issued pursuant to the exercise of Incentive Stock Options pursuant to Section 3(c) and (iv) the class(es) and number of securities and price per share of stock subject to outstanding Stock Awards. The Board will make such adjustments, and its determination will be final, binding and conclusive.

(b) Dissolution. Except as otherwise provided in the Stock Award Agreement, in the event of a Dissolution of the Company, all outstanding Stock Awards (other than Stock Awards consisting of vested and outstanding shares of Common Stock not subject to a forfeiture condition or the Company's right of repurchase) will terminate immediately prior to the completion of such Dissolution, and the shares of Common Stock subject to the Company's repurchase rights or subject to a forfeiture condition may be repurchased or reacquired by the Company notwithstanding the fact that the holder of such Stock Award is providing Continuous Service; *provided*, *however*, that the Board may, in its sole discretion, cause some or all Stock Awards to become fully vested, exercisable and/or no longer subject to repurchase or forfeiture (to the extent such Stock Awards have not previously expired or terminated) before the Dissolution is completed but contingent on its completion.

(c) Transaction. The following provisions shall apply to Stock Awards in the event of a Transaction unless otherwise provided in the instrument evidencing the Stock Award or any other written agreement between the Company or any Affiliate and the Participant or unless otherwise expressly provided by the Board at the time of grant of a Stock Award. In the event of a Transaction, then, notwithstanding any other provision of the Plan, the Board shall take one or more of the following actions with respect to Stock Awards, contingent upon the closing or completion of the Transaction:

(i) arrange for the surviving corporation or acquiring corporation (or the surviving or acquiring corporation's parent company) to assume or continue the Stock Award or to substitute a similar stock award for the Stock Award (including, but not limited to, an award to acquire the same consideration paid to the stockholders of the Company pursuant to the Transaction);

(ii) arrange for the assignment of any reacquisition or repurchase rights held by the Company in respect of Common Stock issued pursuant to the Stock Award to the surviving corporation or acquiring corporation (or the surviving or acquiring corporation's parent company);

(iii) accelerate the vesting, in whole or in part, of the Stock Award (and, if applicable, the time at which the Stock Award may be exercised) to a date prior to the effective time of such Transaction as the Board shall determine (or, if the Board shall not determine such a date, to the date that is five days prior to the effective date of the Transaction), with such Stock Award terminating if not exercised (if applicable) at or prior to the effective time of the Transaction;

(iv) arrange for the lapse, in whole or in part, of any reacquisition or repurchase rights held by the Company with respect to the Stock Award;

(v) cancel or arrange for the cancellation of the Stock Award, to the extent not vested or not exercised prior to the effective time of the Transaction, in exchange for such cash consideration, if any, as the Board, in its sole discretion, may consider appropriate; and

(vi) make a payment, in such form as may be determined by the Board equal to the excess, if any, of (A) the value of the property the Participant would have received upon the exercise of the Stock Award immediately prior to the effective time of the Transaction, over (B) any exercise price payable by such holder in connection with such exercise. For clarity, this

payment may be zero ($0) if the value of the property is equal to or less than the exercise price. Payments under this provision may be delayed to the same extent that payment of consideration to the holders of Common Stock in connection with the Transaction is delayed as a result of escrows, earn outs, holdbacks or other contingencies.

The Board need not take the same action or actions with respect to all Stock Awards or portions thereof or with respect to all Participants. The Board may take different actions with respect to the vested and unvested portions of a Stock Award.

(d) Change in Control. A Stock Award may be subject to additional acceleration of vesting and exercisability upon or after a Change in Control as may be provided in the Stock Award Agreement for such Stock Award or as may be provided in any other written agreement between the Company or any Affiliate and the Participant.

10. PLAN TERM; EARLIER TERMINATION OR SUSPENSION OF THE PLAN.

The Board may suspend or terminate the Plan at any time. No Incentive Stock Options may be granted after the tenth anniversary of the earlier of (i) the date the Plan is adopted by the Board (the "***Adoption Date***"), or (ii) the date the Plan is approved by the stockholders of the Company. No Awards may be granted under the Plan while the Plan is suspended or after it is terminated.

11. EXISTENCE OF THE PLAN; TIMING OF FIRST GRANT OR EXERCISE.

The Plan will come into existence on the Adoption Date; *provided*, *however*, that no Stock Award may be granted prior to the IPO Date. In addition, no Stock Award will be exercised (or, in the case of a Restricted Stock Award, Restricted Stock Unit Award, Performance Stock Award, or Other Stock Award, no Stock Award will be granted) and no Performance Cash Award will be settled unless and until the Plan has been approved by the stockholders of the Company, which approval will be within 12 months after the date the Plan is adopted by the Board.

12. CHOICE OF LAW.

The law of the State of Delaware will govern all questions concerning the construction, validity and interpretation of this Plan, without regard to that state's conflict of laws rules.

13. DEFINITIONS. As used in the Plan, the following definitions will apply to the capitalized terms indicated below:

(a) "***Affiliate***" means, at the time of determination, any "parent" or "subsidiary" of the Company as such terms are defined in Rule 405 of the Securities Act. The Board will have the authority to determine the time or times at which "parent" or "subsidiary" status is determined within the foregoing definition.

(b) "***Award***" means a Stock Award or a Performance Cash Award.

(c) "***Award Agreement***" means a written agreement between the Company and a Participant evidencing the terms and conditions of an Award.

(d) "***Board***" means the Board of Directors of the Company.

(e) "***Capital Stock***" means each and every class of common stock of the Company, regardless of the number of votes per share.

(f) "***Capitalization Adjustment***" means any change that is made in, or other events that occur with respect to, the Common Stock subject to the Plan or subject to any Stock Award after the Adoption Date without the receipt of consideration by the Company through merger, consolidation, reorganization, recapitalization, reincorporation, stock dividend, dividend in property other than cash, large nonrecurring cash dividend, stock split, reverse stock split, liquidating dividend, combination of shares, exchange of shares, change in corporate structure or any similar equity restructuring transaction, as that term is used in Statement of Financial Accounting Standards Board Accounting Standards Codification Topic 718 (or any successor thereto). Notwithstanding the foregoing, the conversion of any convertible securities of the Company will not be treated as a Capitalization Adjustment.

(g) "***Cause***" shall have the meaning ascribed to such term in any written agreement between the Participant and the Company defining such term and, in the absence of such agreement, such term means, with respect to a Participant, the occurrence of any of the following events: (i) such Participant's commission of any felony or any crime involving fraud, dishonesty or moral turpitude under the laws of the United States or any state thereof; (ii) such Participant's attempted commission of, or participation in, a fraud or act of dishonesty against the Company; (iii) such Participant's intentional, material violation of any contract or agreement between the Participant and the Company or of any statutory duty owed to the Company; (iv) such Participant's unauthorized use or disclosure of the Company's confidential information or trade secrets; or (v) such Participant's gross misconduct. The determination that a termination of the Participant's Continuous Service is either for Cause or without Cause shall be made by the Company, in its sole discretion. Any determination by the Company that the Continuous Service of a Participant was terminated with or without Cause for the purposes of outstanding Awards held by such Participant shall have no effect upon any determination of the rights or obligations of the Company or such Participant for any other purpose.

(h) "***Change in Control***" means the occurrence, in a single transaction or in a series of related transactions, of any one or more of the following events:

(i) any Exchange Act Person becomes the Owner, directly or indirectly, of securities of the Company representing more than 50% of the combined voting power of the Company's then outstanding securities other than by virtue of a merger, consolidation or similar transaction. Notwithstanding the foregoing, a Change in Control will not be deemed to occur (A) on account of the acquisition of securities of the Company directly from the Company, (B) on account of the acquisition of securities of the Company by an investor, any affiliate thereof or any other Exchange Act Person that acquires the Company's securities in a transaction or series of related transactions the primary purpose of which is to obtain financing for the Company through the issuance of equity securities, (C) on account of the acquisition of securities

of the Company by any individual who is, on the IPO Date, either an executive officer or a Director (either, an "***IPO Investor***") and/or any entity in which an IPO Investor has a direct or indirect interest (whether in the form of voting rights or participation in profits or capital contributions) of more than 50% (collectively, the "***IPO Entities***") or on account of the IPO Entities continuing to hold shares that come to represent more than 50% of the combined voting power of the Company's then outstanding securities as a result of the conversion of any class of the Company's securities into another class of the Company's securities having a different number of votes per share pursuant to the conversion provisions set forth in the Company's Amended and Restated Certificate of Incorporation; or (D) solely because the level of Ownership held by any Exchange Act Person (the "***Subject Person***") exceeds the designated percentage threshold of the outstanding voting securities as a result of a repurchase or other acquisition of voting securities by the Company reducing the number of shares outstanding, provided that if a Change in Control would occur (but for the operation of this sentence) as a result of the acquisition of voting securities by the Company, and after such share acquisition, the Subject Person becomes the Owner of any additional voting securities that, assuming the repurchase or other acquisition had not occurred, increases the percentage of the then outstanding voting securities Owned by the Subject Person over the designated percentage threshold, then a Change in Control will be deemed to occur;

(ii) there is consummated a merger, consolidation or similar transaction involving (directly or indirectly) the Company and, immediately after the consummation of such merger, consolidation or similar transaction, the stockholders of the Company immediately prior thereto do not Own, directly or indirectly, either (A) outstanding voting securities representing more than 50% of the combined outstanding voting power of the surviving Entity in such merger, consolidation or similar transaction or (B) more than 50% of the combined outstanding voting power of the parent of the surviving Entity in such merger, consolidation or similar transaction, in each case in substantially the same proportions as their Ownership of the outstanding voting securities of the Company immediately prior to such transaction; *provided, however*, that a merger, consolidation or similar transaction will not constitute a Change in Control under this prong of the definition if the outstanding voting securities representing more than 50% of the combined voting power of the surviving Entity or its parent are owned by the IPO Entities;

(iii) there is consummated a sale, lease, exclusive license or other disposition of all or substantially all of the consolidated assets of the Company and its Subsidiaries, other than a sale, lease, license or other disposition of all or substantially all of the consolidated assets of the Company and its Subsidiaries to an Entity, more than 50% of the combined voting power of the voting securities of which are Owned by stockholders of the Company in substantially the same proportions as their Ownership of the outstanding voting securities of the Company immediately prior to such sale, lease, license or other disposition; *provided, however*, that a sale, lease, exclusive license or other disposition of all or substantially all of the consolidated assets of the Company and its Subsidiaries will not constitute a Change in Control under this prong of the definition if the outstanding voting securities representing more than 50% of the combined voting power of the acquiring Entity or its parent are owned by the IPO Entities;

(iv) the stockholders of the Company approve or the Board approves a plan of complete dissolution or liquidation of the Company, or a complete dissolution or liquidation of the Company will otherwise occur, except for a liquidation into a parent corporation; or

(v) individuals who, on the date the Plan is adopted by the Board, are members of the Board (the "***Incumbent Board***") cease for any reason to constitute at least a majority of the members of the Board; *provided, however,* that if the appointment or election (or nomination for election) of any new Board member was approved or recommended by a majority vote of the members of the Incumbent Board then still in office, such new member will, for purposes of this Plan, be considered as a member of the Incumbent Board.

Notwithstanding the foregoing definition or any other provision of the Plan, the term Change in Control will not include a sale of assets, merger or other transaction effected exclusively for the purpose of changing the domicile of the Company and the definition of Change in Control (or any analogous term) in an individual written agreement between the Company or any Affiliate and the Participant will supersede the foregoing definition with respect to Awards subject to such agreement; *provided, however*, that if no definition of Change in Control or any analogous term is set forth in such an individual written agreement, the foregoing definition will apply.

(i) "***Code***" means the Internal Revenue Code of 1986, as amended, including any applicable regulations and guidance thereunder.

(j) "***Committee***" means a committee of one or more Directors to whom authority has been delegated by the Board in accordance with Section 2(c).

(k) "***Common Stock***" means, as of the IPO Date, the common stock of the Company, having one vote per share.

(l) "***Company***" means Personalis, Inc., a Delaware corporation.

(m) "***Consultant***" means any person, including an advisor, who is (i) engaged by the Company or an Affiliate to render consulting or advisory services and is compensated for such services, or (ii) serving as a member of the board of directors of an Affiliate and is compensated for such services. However, service solely as a Director, or payment of a fee for such service, will not cause a Director to be considered a "Consultant" for purposes of the Plan. Notwithstanding the foregoing, a person is treated as a Consultant under this Plan only if a Form S-8 Registration Statement under the Securities Act is available to register either the offer or the sale of the Company's securities to such person.

(n) "***Continuous Service***" means that the Participant's service with the Company or an Affiliate, whether as an Employee, Director or Consultant, is not interrupted or terminated. A change in the capacity in which the Participant renders service to the Company or an Affiliate as an Employee, Consultant or Director or a change in the entity for which the Participant renders such service, provided that there is no interruption or termination of the Participant's service with the Company or an Affiliate, will not terminate a Participant's Continuous Service; *provided, however*, that if the Entity for which a Participant is rendering services ceases to qualify as an Affiliate, as determined by the Board, in its sole discretion, such Participant's

Continuous Service will be considered to have terminated on the date such Entity ceases to qualify as an Affiliate. To the extent permitted by law, the Board or the chief executive officer of the Company, in that party's sole discretion, may determine whether Continuous Service will be considered interrupted in the case of (i) any leave of absence approved by the Board or chief executive officer, including sick leave, military leave or any other personal leave, or (ii) transfers between the Company, an Affiliate, or their successors. Notwithstanding the foregoing, a leave of absence will be treated as Continuous Service for purposes of vesting in an Award only to such extent as may be provided in the Company's leave of absence policy, in the written terms of any leave of absence agreement or policy applicable to the Participant, or as otherwise required by law.

(o) "***Corporate Transaction***" means the consummation, in a single transaction or in a series of related transactions, of any one or more of the following events:

(i) a sale or other disposition of all or substantially all, as determined by the Board, in its sole discretion, of the consolidated assets of the Company and its Subsidiaries;

(ii) a sale or other disposition of more than 50% of the outstanding securities of the Company;

(iii) a merger, consolidation or similar transaction following which the Company is not the surviving corporation; or

(iv) a merger, consolidation or similar transaction following which the Company is the surviving corporation but the shares of Common Stock outstanding immediately preceding the merger, consolidation or similar transaction are converted or exchanged by virtue of the merger, consolidation or similar transaction into other property, whether in the form of securities, cash or otherwise.

(p) "***Director***" means a member of the Board.

(q) "***Disability***" means, with respect to a Participant, the inability of such Participant to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment that can be expected to result in death or that has lasted or can be expected to last for a continuous period of not less than 12 months, as provided in Sections 22(e)(3) and 409A(a)(2)(c)(i) of the Code, and will be determined by the Board on the basis of such medical evidence as the Board deems warranted under the circumstances.

(r) "***Dissolution***" means when the Company, after having executed a certificate of dissolution with the State of Delaware (or other applicable state), has completely wound up its affairs. Conversion of the Company into a Limited Liability Company (or any other pass-through entity) will not be considered a "Dissolution" for purposes of the Plan.

(s) "***Employee***" means any person employed by the Company or an Affiliate. However, service solely as a Director, or payment of a fee for such services, will not cause a Director to be considered an "Employee" for purposes of the Plan.

(t) "***Entity***" means a corporation, partnership, limited liability company or other entity.

(u) "***Exchange Act***" means the Securities Exchange Act of 1934, as amended, and the rules and regulations promulgated thereunder.

(v) "***Exchange Act Person***" means any natural person, Entity or "group" (within the meaning of Section 13(d) or 14(d) of the Exchange Act), except that "Exchange Act Person" will not include (i) the Company or any Subsidiary of the Company, (ii) any employee benefit plan of the Company or any Subsidiary of the Company or any trustee or other fiduciary holding securities under an employee benefit plan of the Company or any Subsidiary of the Company, (iii) an underwriter temporarily holding securities pursuant to a registered public offering of such securities, (iv) an Entity Owned, directly or indirectly, by the stockholders of the Company in substantially the same proportions as their Ownership of stock of the Company; or (v) any natural person, Entity or "group" (within the meaning of Section 13(d) or 14(d) of the Exchange Act) that, as of the IPO Date, is the Owner, directly or indirectly, of securities of the Company representing more than 50% of the combined voting power of the Company's then outstanding securities.

(w) "***Fair Market Value***" means, as of any date, the value of the Common Stock determined as follows:

(i) If the Common Stock is listed on any established stock exchange or traded on any established market, the Fair Market Value of a share of Common Stock will be, unless otherwise determined by the Board, the closing sales price for such stock as quoted on such exchange or market (or the exchange or market with the greatest volume of trading in the Common Stock) on the date of determination, as reported in a source the Board deems reliable.

(ii) Unless otherwise provided by the Board, if there is no closing sales price for the Common Stock on the date of determination, then the Fair Market Value will be the closing selling price on the last preceding date for which such quotation exists.

(iii) In the absence of such markets for the Common Stock, the Fair Market Value will be determined by the Board in good faith and in a manner that complies with Sections 409A and 422 of the Code.

(x) "***Incentive Stock Option***" means an option granted pursuant to Section 5 of the Plan that is intended to be, and qualifies as, an "incentive stock option" within the meaning of Section 422 of the Code.

(y) "***IPO Date***" means the date of the underwriting agreement between the Company and the underwriter(s) managing the initial public offering of the Common Stock, pursuant to which the Common Stock is priced for the initial public offering.

(z) "***Non-Employee Director***" means a Director who either (i) is not a current employee or officer of the Company or an Affiliate, does not receive compensation, either directly or indirectly, from the Company or an Affiliate for services rendered as a consultant or in any capacity other than as a Director (except for an amount as to which disclosure would not

be required under Item 404(a) of Regulation S-K promulgated pursuant to the Securities Act ("***Regulation S-K***")), does not possess an interest in any other transaction for which disclosure would be required under Item 404(a) of Regulation S-K, and is not engaged in a business relationship for which disclosure would be required pursuant to Item 404(b) of Regulation S-K; or (ii) is otherwise considered a "non-employee director" for purposes of Rule 16b-3.

(aa) "***Nonstatutory Stock Option***" means any Option granted pursuant to Section 5 of the Plan that does not qualify as an Incentive Stock Option.

(bb) "***Officer***" means a person who is an officer of the Company within the meaning of Section 16 of the Exchange Act.

(cc) "***Option***" means an Incentive Stock Option or a Nonstatutory Stock Option to purchase shares of Common Stock granted pursuant to the Plan.

(dd) "***Option Agreement***" means a written agreement between the Company and an Optionholder evidencing the terms and conditions of an Option grant. Each Option Agreement will be subject to the terms and conditions of the Plan.

(ee) "***Optionholder***" means a person to whom an Option is granted pursuant to the Plan or, if applicable, such other person who holds an outstanding Option.

(ff) "***Other Stock Award***" means an award based in whole or in part by reference to the Common Stock which is granted pursuant to the terms and conditions of Section 6(d).

(gg) "***Other Stock Award Agreement***" means a written agreement between the Company and a holder of an Other Stock Award evidencing the terms and conditions of an Other Stock Award grant. Each Other Stock Award Agreement will be subject to the terms and conditions of the Plan.

(hh) "***Own,***" "***Owned,***" "***Owner,***" "***Ownership***" means a person or Entity will be deemed to "Own," to have "Owned," to be the "Owner" of, or to have acquired "Ownership" of securities if such person or Entity, directly or indirectly, through any contract, arrangement, understanding, relationship or otherwise, has or shares voting power, which includes the power to vote or to direct the voting, with respect to such securities.

(ii) "***Participant***" means a person to whom an Award is granted pursuant to the Plan or, if applicable, such other person who holds an outstanding Stock Award.

(jj) "***Performance Cash Award***" means an award of cash granted pursuant to the terms and conditions of Section 6(c)(ii).

(kk) "***Performance Criteria***" means the one or more criteria that the Board or Committee (as applicable) will select for purposes of establishing the Performance Goals for a Performance Period. The Performance Criteria that will be used to establish such Performance Goals may be based on any one of, or combination of, the following as determined by the Board: (i) earnings (including earnings per share and net earnings); (ii) earnings before interest, taxes and depreciation; (iii) earnings before interest, taxes, depreciation and amortization; (iv) total

stockholder return; (v) return on equity or average stockholder's equity; (vi) return on assets, investment, or capital employed; (vii) stock price; (viii) margin (including gross margin); (ix) income (before or after taxes); (x) operating income; (xi) operating income after taxes; (xii) pre-tax profit; (xiii) operating cash flow; (xiv) sales or revenue targets; (xv) increases in revenue or product revenue; (xvi) expenses and cost reduction goals; (xvii) improvement in or attainment of working capital levels; (xviii) economic value added (or an equivalent metric); (xix) market share; (xx) cash flow; (xxi) cash flow per share; (xxii) share price performance; (xxiii) debt reduction; (xxiv) customer satisfaction; (xxv) stockholders' equity; (xxvi) capital expenditures; (xxvii) debt levels; (xxviii) operating profit or net operating profit; (xxix) workforce diversity; (xxx) growth of net income or operating income; (xxxi) billings; (xxxii) implementation or completion of projects or processes; (xxxiii) financing; (xxxiv) regulatory milestones; (xxxv) stockholder liquidity; (xxvi) corporate governance and compliance; (xxxvii) product commercialization; (xxxviii) intellectual property; (xxxix) personnel matters; (xl) progress of internal research or clinical programs; (xli) progress of partnered programs; (xlii) partner satisfaction; (xliii) budget management; (xliv) clinical achievements; (xlv) completing phases of a clinical study (including the treatment phase); (xlvi) announcing or presenting preliminary or final data from clinical studies; in each case, whether on particular timelines or generally; (xlvii) timely completion of clinical trials; (xlviii) submission of Device Master File(s) and other regulatory achievements; (xlix) partner or collaborator achievements; (l) internal controls, including those related to the Sarbanes-Oxley Act of 2002; (li) research progress, including the development of programs; (lii) investor relations, analysts and communication; (liii) manufacturing achievements (including obtaining particular yields from manufacturing runs and other measurable objectives related to process development activities); (liv) strategic partnerships or transactions (including in-licensing and out-licensing of intellectual property; (lv) establishing relationships with commercial entities with respect to the marketing, distribution and sale of the Company's products and services (including with group purchasing organizations, distributors and other vendors); (lvi) supply chain achievements (including establishing relationships with manufacturers, suppliers and other services providers of the Company's products and services); (lvii) co-development, co-marketing, profit sharing, joint venture or other similar arrangements; (lviii) individual performance goals; (lix) corporate development and planning goals; and (lx) other measures of performance selected by the Board or Committee.

(ll) "***Performance Goals***" means, for a Performance Period, the one or more goals established by the Board or Committee (as applicable) for the Performance Period based upon the Performance Criteria. Performance Goals may be based on a Company-wide basis, with respect to one or more business units, divisions, Affiliates, or business segments, and in either absolute terms or relative to the performance of one or more comparable companies or the performance of one or more relevant indices. Unless specified otherwise by the Board (i) in the Award Agreement at the time the Award is granted or (ii) in such other document setting forth the Performance Goals at the time the Performance Goals are established, the Board will appropriately make adjustments in the method of calculating the attainment of Performance Goals for a Performance Period as follows: (1) to exclude restructuring and/or other nonrecurring charges; (2) to exclude exchange rate effects; (3) to exclude the effects of changes to generally accepted accounting principles; (4) to exclude the effects of any statutory adjustments to corporate tax rates; (5) to exclude the effects of any items that are unusual in nature or occur infrequently as determined under generally accepted accounting principles; (6) to exclude the dilutive effects of acquisitions or joint ventures; (7) to assume that any business divested by the

Company achieved performance objectives at targeted levels during the balance of a Performance Period following such divestiture; (8) to exclude the effect of any change in the outstanding shares of common stock of the Company by reason of any stock dividend or split, stock repurchase, reorganization, recapitalization, merger, consolidation, spin-off, combination or exchange of shares or other similar corporate change, or any distributions to common stockholders other than regular cash dividends; (9) to exclude the effects of stock based compensation and the award of bonuses under the Company's bonus plans; (10) to exclude costs incurred in connection with potential acquisitions or divestitures that are required to be expensed under generally accepted accounting principles; (11) to exclude the goodwill and intangible asset impairment charges that are required to be recorded under generally accepted accounting principles; and (12) to exclude the effect of any other unusual, non-recurring gain or loss or other extraordinary item. In addition, the Board or Committee (as applicable) retains the discretion to adjust or eliminate the compensation or economic benefit due upon attainment of Performance Goals and to define the manner of calculating the Performance Criteria it selects to use for such Performance Period. Partial achievement of the specified criteria may result in the payment or vesting corresponding to the degree of achievement as specified in the Stock Award Agreement or the written terms of a Performance Cash Award.

(mm) "***Performance Period***" means the period of time selected by the Board or Committee (as applicable) over which the attainment of one or more Performance Goals will be measured for the purpose of determining a Participant's right to and the payment of a Stock Award or a Performance Cash Award. Performance Periods may be of varying and overlapping duration, at the sole discretion of the Board or Committee.

(nn) "***Performance Stock Award***" means a Stock Award granted under the terms and conditions of Section 6(c)(i).

(oo) "***Plan***" means this Personalis, Inc. 2019 Equity Incentive Plan.

(pp) "***Restricted Stock Award***" means an award of shares of Common Stock which is granted pursuant to the terms and conditions of Section 6(a).

(qq) "***Restricted Stock Award Agreement***" means a written agreement between the Company and a holder of a Restricted Stock Award evidencing the terms and conditions of a Restricted Stock Award grant. Each Restricted Stock Award Agreement will be subject to the terms and conditions of the Plan.

(rr) "***Restricted Stock Unit Award***" means a right to receive shares of Common Stock which is granted pursuant to the terms and conditions of Section 6(b).

(ss) "***Restricted Stock Unit Award Agreement***" means a written agreement between the Company and a holder of a Restricted Stock Unit Award evidencing the terms and conditions of a Restricted Stock Unit Award grant. Each Restricted Stock Unit Award Agreement will be subject to the terms and conditions of the Plan.

(tt) "***Rule 16b-3***" means Rule 16b-3 promulgated under the Exchange Act or any successor to Rule 16b-3, as in effect from time to time.

(uu) "***Securities Act***" means the Securities Act of 1933, as amended.

(vv) "***Stock Appreciation Right***" or "***SAR***" means a right to receive the appreciation on Common Stock that is granted pursuant to the terms and conditions of Section 5.

(ww) "***Stock Appreciation Right Agreement***" means a written agreement between the Company and a holder of a Stock Appreciation Right evidencing the terms and conditions of a Stock Appreciation Right grant. Each Stock Appreciation Right Agreement will be subject to the terms and conditions of the Plan.

(xx) "***Stock Award***" means any right to receive Common Stock granted under the Plan, including an Incentive Stock Option, a Nonstatutory Stock Option, a Restricted Stock Award, a Restricted Stock Unit Award, a Stock Appreciation Right, a Performance Stock Award or any Other Stock Award.

(yy) "***Stock Award Agreement***" means a written agreement between the Company and a Participant evidencing the terms and conditions of a Stock Award grant. Each Stock Award Agreement will be subject to the terms and conditions of the Plan.

(zz) "***Subsidiary***" means, with respect to the Company, (i) any corporation of which more than 50% of the outstanding capital stock having ordinary voting power to elect a majority of the board of directors of such corporation (irrespective of whether, at the time, stock of any other class or classes of such corporation will have or might have voting power by reason of the happening of any contingency) is at the time, directly or indirectly, Owned by the Company, and (ii) any partnership, limited liability company or other entity in which the Company has a direct or indirect interest (whether in the form of voting or participation in profits or capital contribution) of more than 50%.

(aaa) "***Ten Percent Stockholder***" means a person who Owns (or is deemed to Own pursuant to Section 424(d) of the Code) stock possessing more than 10% of the total combined voting power of all classes of stock of the Company or any Affiliate.

(bbb) "***Transaction***" means a Corporate Transaction or a Change in Control.

PERSONALIS, INC.

STOCK OPTION GRANT NOTICE
(2019 EQUITY INCENTIVE PLAN)

Personalis, Inc. (the "***Company***"), pursuant to its 2019 Equity Incentive Plan (the "***Plan***"), hereby grants to Optionholder an option to purchase the number of shares of the Company's Common Stock set forth below. This option is subject to all of the terms and conditions as set forth in this Stock Option Grant Notice, in the Option Agreement, the Plan and the Notice of Exercise, all of which are attached hereto and incorporated herein in their entirety. Capitalized terms not explicitly defined herein but defined in the Plan or the Option Agreement will have the same definitions as in the Plan or the Option Agreement. If there is any conflict between the terms in this Stock Option Grant Notice and the Plan, the terms of the Plan will control.

Optionholder:	_____
Date of Grant:	_____
Vesting Commencement Date:	_____
Number of Shares Subject to Option:	_____
Exercise Price (Per Share):	_____
Total Exercise Price:	_____
Expiration Date:	_____

Type of Grant: ☐ Incentive Stock Option[1] ☐ Nonstatutory Stock Option

Exercise Schedule: Same as Vesting Schedule

Vesting Schedule: **[** , subject to Optionholder's Continuous Service as of each such date**]**

Payment: By one or a combination of the following items (described in the Option Agreement):

☐ By cash, check, bank draft or money order payable to the Company
☐ Pursuant to a Regulation T Program if the shares are publicly traded
☐ By delivery of already-owned shares if the shares are publicly traded
☐ If and only to the extent this option is a Nonstatutory Stock Option, and subject to the Company's consent at the time of exercise, by a "net exercise" arrangement

[1] If this is an Incentive Stock Option, it (plus other outstanding Incentive Stock Options) cannot be first *exercisable* for more than $100,000 in value (measured by exercise price) in any calendar year. Any excess over $100,000 is a Nonstatutory Stock Option.

Additional Terms/Acknowledgements: Optionholder acknowledges receipt of, and understands and agrees to, this Stock Option Grant Notice, the Option Agreement and the Plan. Optionholder acknowledges and agrees that this Stock Option Grant Notice and the Option Agreement may not be modified, amended or revised except as provided in the Plan. Optionholder further acknowledges that as of the Date of Grant, this Stock Option Grant Notice, the Option Agreement, and the Plan set forth the entire understanding between Optionholder and the Company regarding this option award and supersede all prior oral and written agreements, promises and/or representations on that subject with the exception of, if applicable, (i) equity awards previously granted and delivered to Optionholder, (ii) any compensation recovery policy that is adopted by the Company or is otherwise required by applicable law and (iii) any written employment agreement, severance agreement, offer letter or other written agreement entered into between the Company and Participant specifying the terms that should govern this specific option. By accepting this option, Optionholder consents to receive such documents by electronic delivery and to participate in the Plan through an on-line or electronic system established and maintained by the Company or another third party designated by the Company.

PERSONALIS, INC.	**OPTIONHOLDER:**
By: _____	_____
Signature	Signature
Title: _____	Date: _____
Date: _____	

ATTACHMENTS: Option Agreement, 2019 Equity Incentive Plan and Notice of Exercise

ATTACHMENT I

PERSONALIS, INC.

OPTION AGREEMENT
(2019 EQUITY INCENTIVE PLAN)
(INCENTIVE STOCK OPTION OR NONSTATUTORY STOCK OPTION)

Pursuant to your Stock Option Grant Notice ("***Grant Notice***") and this Option Agreement, Personalis, Inc. (the "***Company***") has granted you an option under its 2019 Equity Incentive Plan (the "***Plan***") to purchase the number of shares of the Company's Common Stock indicated in your Grant Notice at the exercise price indicated in your Grant Notice. The option is granted to you effective as of the date of grant set forth in the Grant Notice (the "***Date of Grant***"). If there is any conflict between the terms in this Option Agreement and the Plan, the terms of the Plan will control. Capitalized terms not explicitly defined in this Option Agreement or in the Grant Notice but defined in the Plan will have the same definitions as in the Plan.

The details of your option, in addition to those set forth in the Grant Notice and the Plan, are as follows:

1. VESTING. Subject to the provisions contained herein, your option will vest as provided in your Grant Notice. Vesting will cease upon the termination of your Continuous Service.

2. NUMBER OF SHARES AND EXERCISE PRICE. The number of shares of Common Stock subject to your option and your exercise price per share in your Grant Notice will be adjusted for Capitalization Adjustments.

3. EXERCISE RESTRICTION FOR NON-EXEMPT EMPLOYEES. If you are an Employee eligible for overtime compensation under the Fair Labor Standards Act of 1938, as amended (that is, a "***Non-Exempt Employee***"), and except as otherwise provided in the Plan, you may not exercise your option until you have completed at least six (6) months of Continuous Service measured from the Date of Grant, even if you have already been an employee for more than six (6) months. Consistent with the provisions of the Worker Economic Opportunity Act, you may exercise your option as to any vested portion prior to such six (6) month anniversary in the case of (i) your death or disability, (ii) a Corporate Transaction in which your option is not assumed, continued or substituted, (iii) a Change in Control or (iv) your termination of Continuous Service on your "retirement" (as defined in the Company's benefit plans).

4. METHOD OF PAYMENT. You must pay the full amount of the exercise price for the shares you wish to exercise. You may pay the exercise price in cash or by check, bank draft or money order payable to the Company or in any other manner ***permitted by your Grant Notice,*** which may include one or more of the following:

(a) Provided that at the time of exercise the Common Stock is publicly traded, pursuant to a program developed under Regulation T as promulgated by the Federal Reserve Board that, prior to the issuance of Common Stock, results in either the receipt of cash (or check) by the Company or the receipt of irrevocable instructions to pay the aggregate exercise price to the Company from the sales proceeds. This manner of payment is also known as a "broker-assisted exercise", "same day sale", or "sell to cover".

(b) Provided that at the time of exercise the Common Stock is publicly traded, by delivery to the Company (either by actual delivery or attestation) of already-owned shares of Common Stock that are owned free and clear of any liens, claims, encumbrances or security interests, and that are valued at Fair Market Value on the date of exercise. "Delivery" for these purposes, in the sole discretion of the Company at the time you exercise your option, will include delivery to the Company of your attestation of ownership of such shares of Common Stock in a form approved by the Company. You may not exercise your option by delivery to the Company of Common Stock if doing so would violate the provisions of any law, regulation or agreement restricting the redemption of the Company's stock.

(c) If this option is a Nonstatutory Stock Option, subject to the consent of the Company at the time of exercise, by a "net exercise" arrangement pursuant to which the Company will reduce the number of shares of Common Stock issued upon exercise of your option by the largest whole number of shares with a Fair Market Value that does not exceed the aggregate exercise price. You must pay any remaining balance of the aggregate exercise price not satisfied by the "net exercise" in cash or other permitted form of payment. Shares of Common Stock will no longer be outstanding under your option and will not be exercisable thereafter if those shares (i) are used to pay the exercise price pursuant to the "net exercise," (ii) are delivered to you as a result of such exercise, and (iii) are withheld to satisfy your tax withholding obligations.

5. WHOLE SHARES. You may exercise your option only for whole shares of Common Stock.

6. SECURITIES LAW COMPLIANCE. In no event may you exercise your option unless the shares of Common Stock issuable upon exercise are then registered under the Securities Act or, if not registered, the Company has determined that your exercise and the issuance of the shares would be exempt from the registration requirements of the Securities Act. The exercise of your option also must comply with all other applicable laws and regulations governing your option, and you may not exercise your option if the Company determines that such exercise would not be in material compliance with such laws and regulations (including any restrictions on exercise required for compliance with Treas. Reg. 1.401(k)-1(d)(3), if applicable).

7. TERM. You may not exercise your option before the Date of Grant or after the expiration of the option's term. The term of your option expires, subject to the provisions of Section 5(h) of the Plan, upon the earliest of the following:

(a) immediately upon the termination of your Continuous Service for Cause;

(b) three (3) months after the termination of your Continuous Service for any reason other than Cause, your Disability or your death (except as otherwise provided in Section 8(d) below); *provided, however,* that if during any part of such three (3) month period your option is not exercisable solely because of the condition set forth in the section above regarding "Securities Law Compliance," your option will not expire until the earlier of the Expiration Date or until it has been exercisable for an aggregate period of three (3) months after the termination of your Continuous Service; *provided further,* if during any part of such three (3) month period, the sale of any Common Stock received upon exercise of your option would violate the Company's insider trading policy, then your option will not expire until the earlier of the Expiration Date or until it has been exercisable for an aggregate period of three (3) months after the termination of your Continuous Service during which the sale of the Common Stock received upon exercise of your option would not be in violation of the Company's insider trading policy. Notwithstanding the foregoing, if (i) you are a Non-Exempt Employee, (ii) your Continuous Service terminates within six (6) months after the Date of Grant, and (iii) you have vested in a portion of your option at the time of your termination of Continuous Service, your option will not expire until the earlier of (x) the later of (A) the date that is seven (7) months after the Date of Grant, and (B) the date that is three (3) months after the termination of your Continuous Service, and (y) the Expiration Date;

(c) twelve (12) months after the termination of your Continuous Service due to your Disability (except as otherwise provided in Section 7(d)) below;

(d) eighteen (18) months after your death if you die either during your Continuous Service or within three (3) months after your Continuous Service terminates for any reason other than Cause;

(e) the Expiration Date indicated in your Grant Notice; or

(f) the day before the tenth (10th) anniversary of the Date of Grant.

If your option is an Incentive Stock Option, note that to obtain the federal income tax advantages associated with an Incentive Stock Option, the Code requires that at all times beginning on the Date of Grant and ending on the day three (3) months before the date of your option's exercise, you must be an employee of the Company or an Affiliate, except in the event of your death or Disability. The Company has provided for extended exercisability of your option under certain circumstances for your benefit but cannot guarantee that your option will necessarily be treated as an Incentive Stock Option if you continue to provide services to the Company or an Affiliate as a Consultant or Director after your employment terminates or if you otherwise exercise your option more than three (3) months after the date your employment with the Company or an Affiliate terminates.

8. EXERCISE.

(a) You may exercise the vested portion of your option (and the unvested portion of your option if your Grant Notice so permits) during its term by (i) delivering a Notice of Exercise (in a form designated by the Company) or completing such other documents and/or procedures designated by the Company for exercise and (ii) paying the exercise price and any applicable withholding taxes to the Company's Secretary, stock plan administrator, or such other person as the Company may designate, together with such additional documents as the Company may then require.

(b) By exercising your option you agree that, as a condition to any exercise of your option, the Company may require you to enter into an arrangement providing for the payment by you to the Company of any tax withholding obligation of the Company arising by reason of (i) the exercise of your option, (ii) the lapse of any substantial risk of forfeiture to which the shares of Common Stock are subject at the time of exercise, or (iii) the disposition of shares of Common Stock acquired upon such exercise.

(c) If your option is an Incentive Stock Option, by exercising your option you agree that you will notify the Company in writing within fifteen (15) days after the date of any disposition of any of the shares of the Common Stock issued upon exercise of your option that occurs within two (2) years after the Date of Grant or within one (1) year after such shares of Common Stock are transferred upon exercise of your option.

9. TRANSFERABILITY. Except as otherwise provided in this Section 9, your option is not transferable, except by will or by the laws of descent and distribution, and is exercisable during your life only by you.

(a) Certain Trusts. Upon receiving written permission from the Board or its duly authorized designee, you may transfer your option to a trust if you are considered to be the sole beneficial owner (determined under Section 671 of the Code and applicable state law) while the option is held in the trust. You and the trustee must enter into transfer and other agreements required by the Company.

(b) Domestic Relations Orders. Upon receiving written permission from the Board or its duly authorized designee, and provided that you and the designated transferee enter into transfer and other agreements required by the Company, you may transfer your option pursuant to the terms of a domestic relations order, official marital settlement agreement or other divorce or separation instrument as permitted by Treasury Regulation 1.421-1(b)(2) that contains the information required by the Company to effectuate the transfer. You are encouraged to discuss the proposed terms of any division of this option with the Company prior to finalizing the domestic relations order or marital settlement agreement to help ensure the required information is contained within the domestic relations order or marital settlement agreement. If this option is an Incentive Stock Option, this option may be deemed to be a Nonstatutory Stock Option as a result of such transfer.

(c) Beneficiary Designation. Upon receiving written permission from the Board or its duly authorized designee, you may, by delivering written notice to the Company, in a form approved by the Company and any broker designated by the Company to handle option exercises, designate a third party who, on your death, will thereafter be entitled to exercise this option and receive the Common Stock or other consideration resulting from such exercise. In the absence of such a designation, your executor or administrator of your estate will be entitled to exercise this option and receive, on behalf of your estate, the Common Stock or other consideration resulting from such exercise.

10. OPTION NOT A SERVICE CONTRACT. Your option is not an employment or service contract, and nothing in your option will be deemed to create in any way whatsoever any obligation on your part to continue in the employ of the Company or an Affiliate, or of the Company or an Affiliate to continue your employment. In addition, nothing in your option will obligate the Company or an Affiliate, their respective stockholders, boards of directors, officers or employees to continue any relationship that you might have as a Director or Consultant for the Company or an Affiliate.

11. WITHHOLDING OBLIGATIONS.

(a) At the time you exercise your option, in whole or in part, and at any time thereafter as requested by the Company, you hereby authorize withholding from payroll and any other amounts payable to you, and otherwise agree to make adequate provision for (including by means of a "same day sale" pursuant to a program developed under Regulation T as promulgated by the Federal Reserve Board to the extent permitted by the Company), any sums required to satisfy the federal, state, local and foreign tax withholding obligations of the Company or an Affiliate, if any, which arise in connection with the exercise of your option.

(b) If this option is a Nonstatutory Stock Option, then upon your request and subject to approval by the Company, and compliance with any applicable legal conditions or restrictions, the Company may withhold from fully vested shares of Common Stock otherwise issuable to you upon the exercise of your option a number of whole shares of Common Stock having a Fair Market Value, determined by the Company as of the date of exercise, not in excess of the maximum amount of tax required to be withheld by law (or such lower amount as may be necessary to avoid classification of your option as a liability for financial accounting purposes). Notwithstanding the filing of such election, shares of Common Stock shall be withheld solely from fully vested shares of Common Stock determined as of the date of exercise of your option that are otherwise issuable to you upon such exercise. Any adverse consequences to you arising in connection with such share withholding procedure shall be your sole responsibility.

(c) You may not exercise your option unless the tax withholding obligations of the Company and/or any Affiliate are satisfied. Accordingly, you may not be able to exercise your option when desired even though your option is vested, and the Company will have no obligation to issue a certificate for such shares of Common Stock or release such shares of Common Stock from any escrow provided for herein, if applicable, unless such obligations are satisfied.

12. TAX CONSEQUENCES. You hereby agree that the Company does not have a duty to design or administer the Plan or its other compensation programs in a manner that minimizes your tax liabilities. You will not make any claim against the Company, or any of its Officers, Directors, Employees or Affiliates related to tax liabilities arising from your option or your other compensation. In particular, you acknowledge that this option is exempt from Section 409A of the Code only if the exercise price per share specified in the Grant Notice is at least equal to the "fair market value" per share of the Common Stock on the Date of Grant and there is no other impermissible deferral of compensation associated with the option.

13. NOTICES. Any notices provided for in your option or the Plan will be given in writing (including electronically) and will be deemed effectively given upon receipt or, in the case of notices delivered by mail by the Company to you, five (5) days after deposit in the United States mail, postage prepaid, addressed to you at the last address you provided to the Company. The Company may, in its sole discretion, decide to deliver any documents related to participation in the Plan and this option by electronic means or to request your consent to participate in the Plan by electronic means. By accepting this option, you consent to receive such documents by electronic delivery and to participate in the Plan through an on-line or electronic system established and maintained by the Company or another third party designated by the Company.

14. GOVERNING PLAN DOCUMENT. Your option is subject to all the provisions of the Plan, the provisions of which are hereby made a part of your option, and is further subject to all interpretations, amendments, rules and regulations, which may from time to time be promulgated and adopted pursuant to the Plan. If there is any conflict between the provisions of your option and those of the Plan, the provisions of the Plan will control. In addition, your option (and any compensation paid or shares issued under your option) is subject to recoupment in accordance with The Dodd–Frank Wall Street Reform and Consumer Protection Act and any implementing regulations thereunder, any clawback policy adopted by the Company and any compensation recovery policy otherwise required by applicable law.

15. OTHER DOCUMENTS. You hereby acknowledge receipt of and the right to receive a document providing the information required by Rule 428(b)(1) promulgated under the Securities Act, which includes the Plan prospectus. In addition, you acknowledge receipt of the Company's policy permitting certain individuals to sell shares only during certain "window" periods and the Company's insider trading policy, in effect from time to time.

16. EFFECT ON OTHER EMPLOYEE BENEFIT PLANS. The value of this option will not be included as compensation, earnings, salaries, or other similar terms used when calculating your benefits under any employee benefit plan sponsored by the Company or any Affiliate, except as such plan otherwise expressly provides. The Company expressly reserves its rights to amend, modify, or terminate any of the Company's or any Affiliate's employee benefit plans.

17. VOTING RIGHTS. You will not have voting or any other rights as a stockholder of the Company with respect to the shares to be issued pursuant to this option until such shares are issued to

you. Upon such issuance, you will obtain full voting and other rights as a stockholder of the Company. Nothing contained in this option, and no action taken pursuant to its provisions, will create or be construed to create a trust of any kind or a fiduciary relationship between you and the Company or any other person.

18. SEVERABILITY. If all or any part of this Option Agreement or the Plan is declared by any court or governmental authority to be unlawful or invalid, such unlawfulness or invalidity will not invalidate any portion of this Option Agreement or the Plan not declared to be unlawful or invalid. Any Section of this Option Agreement (or part of such a Section) so declared to be unlawful or invalid shall, if possible, be construed in a manner which will give effect to the terms of such Section or part of a Section to the fullest extent possible while remaining lawful and valid.

19. MISCELLANEOUS.

(a) The rights and obligations of the Company under your option will be transferable to any one or more persons or entities, and all covenants and agreements hereunder will inure to the benefit of, and be enforceable by the Company's successors and assigns.

(b) You agree upon request to execute any further documents or instruments necessary or desirable in the sole determination of the Company to carry out the purposes or intent of your option.

(c) You acknowledge and agree that you have reviewed your option in its entirety, have had an opportunity to obtain the advice of counsel prior to executing and accepting your option, and fully understand all provisions of your option.

(d) This Option Agreement will be subject to all applicable laws, rules, and regulations, and to such approvals by any governmental agencies or national securities exchanges as may be required.

(e) All obligations of the Company under the Plan and this Option Agreement will be binding on any successor to the Company, whether the existence of such successor is the result of a direct or indirect purchase, merger, consolidation, or otherwise, of all or substantially all of the business and/or assets of the Company.

* * *

This Option Agreement will be deemed to be signed by you upon the signing by you of the Stock Option Grant Notice to which it is attached.

ATTACHMENT II

2019 EQUITY INCENTIVE PLAN

ATTACHMENT III

NOTICE OF EXERCISE

PERSONALIS, INC.

Date of Exercise:

This constitutes notice to Personalis, Inc. (the "***Company***") under my stock option that I elect to purchase the below number of shares of Common Stock of the Company (the "***Shares***") for the price set forth below.

Type of option (check one):	Incentive ☐	Nonstatutory ☐
Stock option dated:		
Number of Shares as to which option is exercised:		
Certificates to be issued in name of:		
Total exercise price:	$	$
Cash payment delivered herewith:	$	$
[Value of Shares delivered herewith[1]:	$	$]
[Value of Shares pursuant to net exercise[2]:	$	$]
[Regulation T Program (cashless exercise[3]):	$	$]

1 Shares must meet the public trading requirements set forth in the option. Shares must be valued in accordance with the terms of the option being exercised, and must be owned free and clear of any liens, claims, encumbrances or security interests. Certificates must be endorsed or accompanied by an executed assignment separate from certificate.

2 The option must be a Nonstatutory Stock Option, and the Company must have established net exercise procedures at the time of exercise, in order to utilize this payment method.

3 Shares must meet the public trading requirements set forth in the option.

By this exercise, I agree (i) to provide such additional documents as you may require pursuant to the terms of the Personalis, Inc. 2019 Equity Incentive Plan, (ii) to provide for the payment by me to you (in the manner designated by you) of your withholding obligation, if any, relating to the exercise of this option, and (iii) if this exercise relates to an incentive stock option, to notify you in writing within fifteen (15) days after the date of any disposition of any of the Shares issued upon exercise of this option that occurs within two (2) years after the date of grant of this option or within one (1) year after such Shares are issued upon exercise of this option.

Very truly yours,

_____

PERSONALIS, INC.

RESTRICTED STOCK UNIT GRANT NOTICE
(2019 EQUITY INCENTIVE PLAN)

Personalis, Inc. (the "***Company***"), pursuant to its 2019 Equity Incentive Plan (the "***Plan***"), hereby awards to Participant a Restricted Stock Unit Award for the number of shares of the Company's Common Stock ("***Restricted Stock Units***") set forth below (the "***Award*** "). The Award is subject to all of the terms and conditions as set forth in this notice of grant (this "***Restricted Stock Unit Grant Notice***"), and in the Plan and the Restricted Stock Unit Award Agreement (the "***Award Agreement***"), both of which are attached hereto and incorporated herein in their entirety. Capitalized terms not explicitly defined herein shall have the meanings set forth in the Plan or the Award Agreement. In the event of any conflict between the terms in this Restricted Stock Unit Grant Notice or the Award Agreement and the Plan, the terms of the Plan shall control.

Participant:	_____
Date of Grant:	_____
Vesting Commencement Date:	_____
Number of Restricted Stock Units:	_____

Vesting Schedule: [, subject to Participant's Continuous Service through each such vesting date.]

Issuance Schedule: Subject to any Capitalization Adjustment, one share of Common Stock (or its cash equivalent, at the discretion of the Company) will be issued for each Restricted Stock Unit that vests at the time set forth in Section 6 of the Award Agreement.

Additional Terms/Acknowledgements: Participant acknowledges receipt of, and understands and agrees to, this Restricted Stock Unit Grant Notice, the Award Agreement and the Plan. Participant further acknowledges that as of the Date of Grant, this Restricted Stock Unit Grant Notice, the Award Agreement and the Plan set forth the entire understanding between Participant and the Company regarding the acquisition of the Common Stock pursuant to the Award specified above and supersede all prior oral and written agreements on the terms of this Award, with the exception, if applicable, of (i) restricted stock unit awards or options previously granted and delivered to Participant, (ii) the written employment agreement, offer letter or other written agreement entered into between the Company and Participant specifying the terms that should govern this specific Award, and (iii) any compensation recovery policy that is adopted by the Company or is otherwise required by applicable law.

By accepting this Award, Participant acknowledges having received and read the Restricted Stock Unit Grant Notice, the Award Agreement and the Plan and agrees to all of the terms and conditions set forth in these documents. Participant consents to receive Plan documents by electronic delivery and to participate in the Plan through an on-line or electronic system established and maintained by the Company or another third party designated by the Company.

PERSONALIS, INC.	**PARTICIPANT**
By: _____	_____
Signature	Signature
Title: _____	Date: _____
Date: _____	

ATTACHMENTS: Award Agreement and 2019 Equity Incentive Plan

ATTACHMENT I

PERSONALIS, INC.

2019 EQUITY INCENTIVE PLAN
RESTRICTED STOCK UNIT AWARD AGREEMENT

Pursuant to the Restricted Stock Unit Grant Notice (the "***Grant Notice***") and this Restricted Stock Unit Award Agreement (the "***Agreement***"), Personalis, Inc. (the "***Company***") has awarded you ("***Participant***") a Restricted Stock Unit Award (the "***Award***") pursuant to the Company's 2019 Equity Incentive Plan (the "***Plan***") for the number of Restricted Stock Units/shares indicated in the Grant Notice. Capitalized terms not explicitly defined in this Agreement or the Grant Notice shall have the same meanings given to them in the Plan. The terms of your Award, in addition to those set forth in the Grant Notice, are as follows.

1. GRANT OF THE AWARD. This Award represents the right to be issued on a future date one (1) share of Common Stock for each Restricted Stock Unit that vests on the applicable vesting date(s) (subject to any adjustment under Section 3 below) as indicated in the Grant Notice. As of the Date of Grant, the Company will credit to a bookkeeping account maintained by the Company for your benefit (the "***Account***") the number of Restricted Stock Units/shares of Common Stock subject to the Award. Notwithstanding the foregoing, the Company reserves the right to issue you the cash equivalent of Common Stock, in part or in full satisfaction of the delivery of Common Stock in connection with the vesting of the Restricted Stock Units, and, to the extent applicable, references in this Agreement and the Grant Notice to Common Stock issuable in connection with your Restricted Stock Units will include the potential issuance of its cash equivalent pursuant to such right. This Award was granted in consideration of your services to the Company.

2. VESTING. Subject to the limitations contained herein, your Award will vest, if at all, in accordance with the vesting schedule provided in the Grant Notice. Vesting will cease upon the termination of your Continuous Service and the Restricted Stock Units credited to the Account that were not vested on the date of such termination will be forfeited at no cost to the Company and you will have no further right, title or interest in or to such Award or the shares of Common Stock to be issued in respect of such portion of the Award.

3. NUMBER OF SHARES. The number of Restricted Stock Units subject to your Award may be adjusted from time to time for Capitalization Adjustments, as provided in the Plan. Any additional Restricted Stock Units, shares, cash or other property that becomes subject to the Award pursuant to this Section 3, if any, shall be subject, in a manner determined by the Board, to the same forfeiture restrictions, restrictions on transferability, and time and manner of delivery as applicable to the other Restricted Stock Units and shares covered by your Award. Notwithstanding the provisions of this Section 3, no fractional shares or rights for fractional shares of Common Stock shall be created pursuant to this Section 3. Any fraction of a share will be rounded down to the nearest whole share.

4. SECURITIES LAW COMPLIANCE. You may not be issued any Common Stock under your Award unless the shares of Common Stock underlying the Restricted Stock Units are either (i) then registered under the Securities Act, or (ii) the Company has determined that such issuance would be exempt from the registration requirements of the Securities Act. Your Award must also comply with other applicable laws and regulations governing the Award, and you shall not receive such Common Stock if the Company determines that such receipt would not be in material compliance with such laws and regulations.

5. TRANSFER RESTRICTIONS. Prior to the time that shares of Common Stock have been delivered to you, you may not transfer, pledge, sell or otherwise dispose of this Award or the shares issuable in respect of your Award, except as expressly provided in this Section 5. For example, you may not use shares that may be issued in respect of your Restricted Stock Units as security for a loan. The restrictions on transfer set forth herein will lapse upon delivery to you of shares in respect of your vested Restricted Stock Units.

(a) Death. Your Award is transferable by will and by the laws of descent and distribution. At your death, vesting of your Award will cease and your executor or administrator of your estate shall be entitled to receive, on behalf of your estate, any Common Stock or other consideration that vested but was not issued before your death.

(b) Domestic Relations Orders. Upon receiving written permission from the Board or its duly authorized designee, and provided that you and the designated transferee enter into transfer and other agreements required by the Company, you may transfer your right to receive the distribution of Common Stock or other consideration hereunder, pursuant to a domestic relations order, marital settlement agreement or other divorce or separation instrument as permitted by applicable law that contains the information required by the Company to effectuate the transfer. You are encouraged to discuss the proposed terms of any division of this Award with the Company General Counsel prior to finalizing the domestic relations order or marital settlement agreement to verify that you may make such transfer, and if so, to help ensure the required information is contained within the domestic relations order or marital settlement agreement.

6. DATE OF ISSUANCE.

(a) The issuance of shares in respect of the Restricted Stock Units is intended to comply with Treasury Regulations Section 1.409A-1(b)(4) and will be construed and administered in such a manner. Subject to the satisfaction of the Withholding Obligation set forth in Section 11 of this Agreement, in the event one or more Restricted Stock Units vests, the Company shall issue to you one (1) share of Common Stock for each Restricted Stock Unit that vests on the applicable vesting date(s) (subject to any adjustment under Section 3 above, and subject to any different provisions in the Grant Notice). Each issuance date determined by this paragraph is referred to as an "***Original Issuance Date***".

(b) If the Original Issuance Date falls on a date that is not a business day, delivery shall instead occur on the next following business day. In addition, if:

(i) the Original Issuance Date does not occur (1) during an "open window period" applicable to you, as determined by the Company in accordance with the Company's then-effective policy on trading in Company securities, or (2) on a date when you are otherwise permitted to sell shares of Common Stock on an established stock exchange or stock market (including but not limited to under a previously established written trading plan that meets the requirements of Rule 10b5-1 under the Exchange Act and was entered into in compliance with the Company's policies (a "***10b5-1 Arrangement***")), *and*

(ii) either (1) a Withholding Obligation does not apply, or (2) the Company decides, prior to the Original Issuance Date, (A) not to satisfy the Withholding Obligation by withholding shares of Common Stock from the shares otherwise due, on the Original Issuance Date, to you under this Award, and (B) not to permit you to enter into a "same day sale" commitment with a broker-dealer pursuant to Section 11 of this Agreement (including but not limited to a commitment under a 10b5-1 Arrangement) and (C) not to permit you to pay your Withholding Obligation in cash,

then the shares that would otherwise be issued to you on the Original Issuance Date will not be delivered on such Original Issuance Date and will instead be delivered on the first business day when you are not prohibited from selling shares of the Company's Common Stock in the open public market, but in no event later than December 31 of the calendar year in which the Original Issuance Date occurs (that is, the last day of your taxable year in which the Original Issuance Date occurs), or, if and only if permitted in a manner that complies with Treasury Regulations Section 1.409A-1(b)(4), no later than the date that is the 15th day of the third calendar month of the applicable year following the year in which the shares of Common Stock under this Award are no longer subject to a "substantial risk of forfeiture" within the meaning of Treasury Regulations Section 1.409A-1(d).

(c) The form of delivery (*e.g.*, a stock certificate or electronic entry evidencing such shares) shall be determined by the Company.

7. DIVIDENDS. You shall receive no benefit or adjustment to your Award with respect to any cash dividend, stock dividend or other distribution that does not result from a Capitalization Adjustment; provided, however, that this sentence will not apply with respect to any shares of Common Stock that are delivered to you in connection with your Award after such shares have been delivered to you.

8. RESTRICTIVE LEGENDS. The shares of Common Stock issued in respect of your Award shall be endorsed with appropriate legends as determined by the Company.

9. EXECUTION OF DOCUMENTS. You hereby acknowledge and agree that the manner selected by the Company by which you indicate your consent to your Grant Notice is also deemed to be your execution of your Grant Notice and of this Agreement. You further agree that such manner of indicating consent may be relied upon as your signature for establishing your execution of any documents to be executed in the future in connection with your Award.

10. AWARD NOT A SERVICE CONTRACT.

(a) Nothing in this Agreement (including, but not limited to, the vesting of your Award or the issuance of the shares in respect of your Award), the Plan or any covenant of good faith and fair dealing that may be found implicit in this Agreement or the Plan shall: (i) confer upon you any right to continue in the employ or service of, or affiliation with, the Company or an Affiliate; (ii) constitute any promise or commitment by the Company or an Affiliate regarding the fact or nature of future positions, future work assignments, future compensation or any other term or condition of employment or affiliation; (iii) confer any right or benefit under this Agreement or the Plan unless such right or benefit has specifically accrued under the terms of this Agreement or Plan; or (iv) deprive the Company of the right to terminate you at will and without regard to any future vesting opportunity that you may have.

(b) By accepting this Award, you acknowledge and agree that the right to continue vesting in the Award pursuant to the vesting schedule provided in the Grant Notice may not be earned unless (in addition to any other conditions described in the Grant Notice and this Agreement) you continue as an employee, director or consultant at the will of the Company and affiliate, as applicable (not through the act of being hired, being granted this Award or any other award or benefit) and that the Company has the right to reorganize, sell, spin-out or otherwise restructure one or more of its businesses or Affiliates at any time or from time to time, as it deems appropriate (a "***reorganization***"). You acknowledge and agree that such a reorganization could result in the termination of your Continuous Service, or the termination of Affiliate status of your employer and the loss of benefits available to you under this Agreement, including but not limited to, the termination of the right to continue vesting in the Award. You further acknowledge and agree that this Agreement, the Plan, the transactions contemplated

hereunder and the vesting schedule set forth herein or any covenant of good faith and fair dealing that may be found implicit in any of them do not constitute an express or implied promise of continued engagement as an employee or consultant for the term of this Agreement, for any period, or at all, and shall not interfere in any way with the Company's right to terminate your Continuous Service at any time, with or without your cause or notice, or to conduct a reorganization.

11. WITHHOLDING OBLIGATION.

(a) On each vesting date, and on or before the time you receive a distribution of the shares of Common Stock in respect of your Restricted Stock Units, and at any other time as reasonably requested by the Company in accordance with applicable tax laws, you hereby authorize any required withholding from the Common Stock issuable to you and/or otherwise agree to make adequate provision, including in cash, for any sums required to satisfy the federal, state, local and foreign tax withholding obligations of the Company or any Affiliate that arise in connection with your Award (the "***Withholding Obligation***").

(b) By accepting this Award, you acknowledge and agree that the Company or any Affiliate may, in its sole discretion, satisfy all or any portion of the Withholding Obligation relating to your Restricted Stock Units by any of the following means or by a combination of such means: (i) causing you to pay any portion of the Withholding Obligation in cash; (ii) withholding from any compensation otherwise payable to you by the Company; (iii) withholding shares of Common Stock from the shares of Common Stock issued or otherwise issuable to you in connection with the Award with a Fair Market Value (measured as of the date shares of Common Stock are issued pursuant to Section 6) equal to the amount of such Withholding Obligation; provided, however, that the number of such shares of Common Stock so withheld will not exceed the amount necessary to satisfy the Withholding Obligation using the maximum statutory withholding rates for federal, state, local and foreign tax purposes, including payroll taxes, that are applicable to supplemental taxable income; and *provided*, further, that to the extent necessary to qualify for an exemption from application of Section 16(b) of the Exchange Act, if applicable, such share withholding procedure will be subject to the express prior approval of the Board or the Company's Compensation Committee; and/or (iv) permitting or requiring you to enter into a "same day sale" commitment, if applicable, with a broker-dealer that is a member of the Financial Industry Regulatory Authority (a "***FINRA Dealer***"), pursuant to this authorization and without further consent, whereby you irrevocably elect to sell a portion of the shares to be delivered in connection with your Restricted Stock Units to satisfy the Withholding Obligation and whereby the FINRA Dealer irrevocably commits to forward the proceeds necessary to satisfy the Withholding Obligation directly to the Company and/or its Affiliates. Unless the Withholding Obligation is satisfied, the Company shall have no obligation to deliver to you any Common Stock or any other consideration pursuant to this Award.

(c) In the event the Withholding Obligation arises prior to the delivery to you of Common Stock or it is determined after the delivery of Common Stock to you that the amount of the Withholding Obligation was greater than the amount withheld by the Company, you agree to indemnify and hold the Company harmless from any failure by the Company to withhold the proper amount.

12. TAX CONSEQUENCES. The Company has no duty or obligation to minimize the tax consequences to you of this Award and shall not be liable to you for any adverse tax consequences to you arising in connection with this Award. You are hereby advised to consult with your own personal tax, financial and/or legal advisors regarding the tax consequences of this Award and by signing the Grant Notice, you have agreed that you have done so or knowingly and voluntarily declined to do so. You understand that you (and not the Company) shall be responsible for your own tax liability that may arise as a result of this investment or the transactions contemplated by this Agreement.

13. UNSECURED OBLIGATION. Your Award is unfunded, and as a holder of a vested Award, you shall be considered an unsecured creditor of the Company with respect to the Company's obligation, if any, to issue shares or other property pursuant to this Agreement. You shall not have voting or any other rights as a stockholder of the Company with respect to the shares to be issued pursuant to this Agreement until such shares are issued to you pursuant to Section 6 of this Agreement. Upon such issuance, you will obtain full voting and other rights as a stockholder of the Company. Nothing contained in this Agreement, and no action taken pursuant to its provisions, shall create or be construed to create a trust of any kind or a fiduciary relationship between you and the Company or any other person.

14. NOTICES. Any notice or request required or permitted hereunder shall be given in writing (including electronically) and will be deemed effectively given upon receipt or, in the case of notices delivered by mail by the Company to you, five (5) days after deposit in the United States mail, postage prepaid, addressed to you at the last address you provided to the Company. The Company may, in its sole discretion, decide to deliver any documents related to participation in the Plan and this Award by electronic means or to request your consent to participate in the Plan by electronic means. By accepting this Award, you consent to receive such documents by electronic delivery and to participate in the Plan through an on-line or electronic system established and maintained by the Company or another third party designated by the Company.

15. HEADINGS. The headings of the Sections in this Agreement are inserted for convenience only and shall not be deemed to constitute a part of this Agreement or to affect the meaning of this Agreement.

16. MISCELLANEOUS.

(a) The rights and obligations of the Company under your Award shall be transferable by the Company to any one or more persons or entities, and all covenants and agreements hereunder shall inure to the benefit of, and be enforceable by, the Company's successors and assigns.

(b) You agree upon request to execute any further documents or instruments necessary or desirable in the sole determination of the Company to carry out the purposes or intent of your Award.

(c) You acknowledge and agree that you have reviewed your Award in its entirety, have had an opportunity to obtain the advice of counsel prior to executing and accepting your Award and fully understand all provisions of your Award.

(d) This Agreement shall be subject to all applicable laws, rules, and regulations, and to such approvals by any governmental agencies or national securities exchanges as may be required.

(e) All obligations of the Company under the Plan and this Agreement shall be binding on any successor to the Company, whether the existence of such successor is the result of a direct or indirect purchase, merger, consolidation, or otherwise, of all or substantially all of the business and/or assets of the Company.

17. GOVERNING PLAN DOCUMENT. Your Award is subject to all the provisions of the Plan, the provisions of which are hereby made a part of your Award, and is further subject to all interpretations, amendments, rules and regulations which may from time to time be promulgated and adopted pursuant to the Plan. Your Award (and any compensation paid or shares issued under your Award) is subject to recoupment in accordance with The Dodd–Frank Wall Street Reform and Consumer Protection Act and

any implementing regulations thereunder, any clawback policy adopted by the Company and any compensation recovery policy otherwise required by applicable law. No recovery of compensation under such a clawback policy will be an event giving rise to a right to voluntarily terminate employment upon a resignation for "good reason," or for a "constructive termination" or any similar term under any plan of or agreement with the Company.

18. EFFECT ON OTHER EMPLOYEE BENEFIT PLANS. The value of the Award subject to this Agreement shall not be included as compensation, earnings, salaries, or other similar terms used when calculating benefits under any employee benefit plan (other than the Plan) sponsored by the Company or any Affiliate except as such plan otherwise expressly provides. The Company expressly reserves its rights to amend, modify, or terminate any or all of the employee benefit plans of the Company or any Affiliate.

19. SEVERABILITY. If all or any part of this Agreement or the Plan is declared by any court or governmental authority to be unlawful or invalid, such unlawfulness or invalidity shall not invalidate any portion of this Agreement or the Plan not declared to be unlawful or invalid. Any Section of this Agreement (or part of such a Section) so declared to be unlawful or invalid shall, if possible, be construed in a manner which will give effect to the terms of such Section or part of a Section to the fullest extent possible while remaining lawful and valid.

20. OTHER DOCUMENTS. You hereby acknowledge receipt or the right to receive a document providing the information required by Rule 428(b)(1) promulgated under the Securities Act. In addition, you acknowledge receipt of the Company's policy permitting certain individuals to sell shares only during certain "window" periods and the Company's insider trading policy, in effect from time to time.

21. AMENDMENT. This Agreement may not be modified, amended or terminated except by an instrument in writing, signed by you and by a duly authorized representative of the Company. Notwithstanding the foregoing, this Agreement may be amended solely by the Board by a writing which specifically states that it is amending this Agreement, so long as a copy of such amendment is delivered to you, and provided that, except as otherwise expressly provided in the Plan, no such amendment materially adversely affecting your rights hereunder may be made without your written consent. Without limiting the foregoing, the Board reserves the right to change, by written notice to you, the provisions of this Agreement in any way it may deem necessary or advisable to carry out the purpose of the Award as a result of any change in applicable laws or regulations or any future law, regulation, ruling, or judicial decision, provided that any such change shall be applicable only to rights relating to that portion of the Award which is then subject to restrictions as provided herein.

22. COMPLIANCE WITH SECTION 409A OF THE CODE. This Award is intended to be exempt from the application of Section 409A of the Code, including but not limited to by reason of complying with the "short-term deferral" rule set forth in Treasury Regulation Section 1.409A-1(b)(4) and any ambiguities herein shall be interpreted accordingly. Notwithstanding the foregoing, if it is determined that the Award fails to satisfy the requirements of the short-term deferral rule and is otherwise not exempt from, and determined to be deferred compensation subject to Section 409A of the Code, this Award shall comply with Section 409A to the extent necessary to avoid adverse personal tax consequences and any ambiguities herein shall be interpreted accordingly. If it is determined that the Award is deferred compensation subject to Section 409A and you are a "Specified Employee" (within the meaning set forth in Section 409A(a)(2)(B)(i) of the Code) as of the date of your "Separation from Service" (as defined in Section 409A), then the issuance of any shares that would otherwise be made upon the date of your Separation from Service or within the first six (6) months thereafter will not be made on the originally scheduled date(s) and will instead be issued in a lump sum on the date that is six (6) months

and one day after the date of the Separation from Service, with the balance of the shares issued thereafter in accordance with the original vesting and issuance schedule set forth above, but if and only if such delay in the issuance of the shares is necessary to avoid the imposition of adverse taxation on you in respect of the shares under Section 409A of the Code. Each installment of shares that vests is intended to constitute a "separate payment" for purposes of Treasury Regulation Section 1.409A-2(b)(2).

* * * * *

This Restricted Stock Unit Award Agreement shall be deemed to be signed by the Company and the Participant upon the signing by the Participant of the Restricted Stock Unit Grant Notice to which it is attached.

ATTACHMENT II

2019 EQUITY INCENTIVE PLAN

Exhibit 10.3

PERSONALIS, INC.

2019 EMPLOYEE STOCK PURCHASE PLAN

ADOPTED BY THE BOARD OF DIRECTORS: MAY 23, 2019
AMENDED BY THE BOARD OF DIRECTORS: JUNE 2, 2019
APPROVED BY THE STOCKHOLDERS: JUNE 4, 2019
IPO DATE: , 2019

1. GENERAL; PURPOSE.

(a) The Plan provides a means by which Eligible Employees of the Company and certain designated Related Corporations may be given an opportunity to purchase shares of Common Stock. The Plan permits the Company to grant a series of Purchase Rights to Eligible Employees under an Employee Stock Purchase Plan.

(b) The Company, by means of the Plan, seeks to retain the services of such Employees, to secure and retain the services of new Employees and to provide incentives for such persons to exert maximum efforts for the success of the Company and its Related Corporations.

2. ADMINISTRATION.

(a) The Board will administer the Plan unless and until the Board delegates administration of the Plan to a Committee or Committees, as provided in Section 2(c).

(b) The Board will have the power, subject to, and within the limitations of, the express provisions of the Plan:

(i) To determine how and when Purchase Rights will be granted and the provisions of each Offering (which need not be identical).

(ii) To designate from time to time which Related Corporations of the Company will be eligible to participate in the Plan.

(iii) To construe and interpret the Plan and Purchase Rights, and to establish, amend and revoke rules and regulations for its administration. The Board, in the exercise of this power, may correct any defect, omission or inconsistency in the Plan, in a manner and to the extent it deems necessary or expedient to make the Plan fully effective.

(iv) To settle all controversies regarding the Plan and Purchase Rights granted under the Plan.

(v) To suspend or terminate the Plan at any time as provided in Section 12.

(vi) To amend the Plan at any time as provided in Section 12.

(vii) Generally, to exercise such powers and to perform such acts as it deems necessary or expedient to promote the best interests of the Company and its Related Corporations and to carry out the intent that the Plan be treated as an Employee Stock Purchase Plan.

(viii) To adopt such rules, procedures and sub-plans relating to the operation and administration of the Plan as are necessary or appropriate under applicable local laws, regulations and procedures to permit or facilitate participation in the Plan by Employees who are foreign nationals or employed or located outside the United States.

(c) The Board may delegate some or all of the administration of the Plan to a Committee or Committees. If administration is delegated to a Committee, the Committee will have, in connection with the administration of the Plan, the powers theretofore possessed by the Board that have been delegated to the Committee, including the power to delegate to a subcommittee any of the administrative powers the Committee is authorized to exercise (and references in this Plan to the Board will thereafter be to the Committee or subcommittee), subject, however, to such resolutions, not inconsistent with the provisions of the Plan, as may be adopted from time to time by the Board. The Board may retain the authority to concurrently administer the Plan with the Committee and may, at any time, revest in the Board some or all of the powers previously delegated. Whether or not the Board has delegated administration of the Plan to a Committee, the Board will have the final power to determine all questions of policy and expediency that may arise in the administration of the Plan.

(d) All determinations, interpretations and constructions made by the Board in good faith will not be subject to review by any person and will be final, binding and conclusive on all persons.

3. SHARES OF COMMON STOCK SUBJECT TO THE PLAN.

(a) Subject to the provisions of Section 11(a) relating to Capitalization Adjustments, the maximum number of shares of Common Stock that may be issued under the Plan will not exceed 250,000 shares of Common Stock, plus the number of shares of Common Stock that are automatically added on January 1st of each year for a period of up to ten years, commencing on the first January 1 following the year in which the IPO Date occurs and ending on (and including) January 1, 2029, in an amount equal to the lesser of (i) 1% of the total number of shares of Capital Stock outstanding on December 31st of the preceding calendar year, and (ii) 500,000 shares of Common Stock. Notwithstanding the foregoing, the Board may act prior to the first day of any calendar year to provide that there will be no January 1st increase in the share reserve for such calendar year or that the increase in the share reserve for such calendar year will be a lesser number of shares of Common Stock than would otherwise occur pursuant to the preceding sentence.

(b) If any Purchase Right granted under the Plan terminates without having been exercised in full, the shares of Common Stock not purchased under such Purchase Right will again become available for issuance under the Plan.

(c) The stock purchasable under the Plan will be shares of authorized but unissued or reacquired Common Stock, including shares repurchased by the Company on the open market.

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4. GRANT OF PURCHASE RIGHTS; OFFERING.

(a) The Board may from time to time grant or provide for the grant of Purchase Rights to Eligible Employees under an Offering (consisting of one or more Purchase Periods) on an Offering Date or Offering Dates selected by the Board. Each Offering will be in such form and will contain such terms and conditions as the Board will deem appropriate, and will comply with the requirement of Section 423(b)(5) of the Code that all Employees granted Purchase Rights will have the same rights and privileges. The terms and conditions of an Offering shall be incorporated by reference into the Plan and treated as part of the Plan. The provisions of separate Offerings need not be identical, but each Offering will include (through incorporation of the provisions of this Plan by reference in the document comprising the Offering or otherwise) the period during which the Offering will be effective, which period will not exceed 27 months beginning with the Offering Date, and the substance of the provisions contained in Sections 5 through 8, inclusive.

(b) If a Participant has more than one Purchase Right outstanding under the Plan, unless he or she otherwise indicates in forms delivered to the Company: (i) each form will apply to all of his or her Purchase Rights under the Plan, and (ii) a Purchase Right with a lower exercise price (or an earlier-granted Purchase Right, if different Purchase Rights have identical exercise prices) will be exercised to the fullest possible extent before a Purchase Right with a higher exercise price (or a later-granted Purchase Right if different Purchase Rights have identical exercise prices) will be exercised.

(c) The Board will have the discretion to structure an Offering so that if the Fair Market Value of a share of Common Stock on the first Trading Day of a new Purchase Period within that Offering is less than or equal to the Fair Market Value of a share of Common Stock on the Offering Date for that Offering, then (i) that Offering will terminate immediately as of that first Trading Day, and (ii) the Participants in such terminated Offering will be automatically enrolled in a new Offering beginning on the first Trading Day of such new Purchase Period.

5. ELIGIBILITY.

(a) Purchase Rights may be granted only to Employees of the Company or, as the Board may designate in accordance with Section 2(b), to Employees of a Related Corporation. Except as provided in Section 5(b), an Employee will not be eligible to be granted Purchase Rights unless, on the Offering Date, the Employee has been in the employ of the Company or the Related Corporation, as the case may be, for such continuous period preceding such Offering Date as the Board may require, but in no event will the required period of continuous employment be equal to or greater than two years. In addition, the Board may (unless prohibited by law) provide that no Employee will be eligible to be granted Purchase Rights under the Plan unless, on the Offering Date, such Employee's customary employment with the Company or the Related Corporation is more than 20 hours per week and more than five months per calendar year or such other criteria as the Board may determine consistent with Section 423 of the Code. The Board may also exclude from participation in the Plan or any Offering Employees who are "highly compensated employees" (within the meaning of Section 414(q) of the Code) of the Company or a Related Corporation or a subset of such highly compensated employees.

(b) The Board may provide that each person who, during the course of an Offering, first becomes an Eligible Employee will, on a date or dates specified in the Offering which coincides with the day on which such person becomes an Eligible Employee or which occurs thereafter, receive a Purchase Right under that Offering, which Purchase Right will thereafter be deemed to be a part of that Offering. Such Purchase Right will have the same characteristics as any Purchase Rights originally granted under that Offering, as described herein, except that:

(i) the date on which such Purchase Right is granted will be the "Offering Date" of such Purchase Right for all purposes, including determination of the exercise price of such Purchase Right;

(ii) the period of the Offering with respect to such Purchase Right will begin on its Offering Date and end coincident with the end of such Offering; and

(iii) the Board may provide that if such person first becomes an Eligible Employee within a specified period of time before the end of the Offering, he or she will not receive any Purchase Right under that Offering.

(c) No Employee will be eligible for the grant of any Purchase Rights if, immediately after any such Purchase Rights are granted, such Employee owns stock possessing five percent or more of the total combined voting power or value of all classes of stock of the Company or of any Related Corporation. For purposes of this Section 5(c), the rules of Section 424(d) of the Code will apply in determining the stock ownership of any Employee, and stock which such Employee may purchase under all outstanding Purchase Rights and options will be treated as stock owned by such Employee.

(d) As specified by Section 423(b)(8) of the Code, an Eligible Employee may be granted Purchase Rights only if such Purchase Rights, together with any other rights granted under all Employee Stock Purchase Plans of the Company and any Related Corporations, do not permit such Eligible Employee's rights to purchase stock of the Company or any Related Corporation to accrue at a rate which, when aggregated, exceeds US $25,000 of Fair Market Value of such stock (determined at the time such rights are granted, and which, with respect to the Plan, will be determined as of their respective Offering Dates) for each calendar year in which such rights are outstanding at any time.

(e) Officers of the Company and any designated Related Corporation, if they are otherwise Eligible Employees, will be eligible to participate in Offerings under the Plan. Notwithstanding the foregoing, the Board may (unless prohibited by law) provide in an Offering that Employees who are highly compensated Employees within the meaning of Section 423(b)(4)(D) of the Code will not be eligible to participate.

6. PURCHASE RIGHTS; PURCHASE PRICE.

(a) On each Offering Date, each Eligible Employee, pursuant to an Offering made under the Plan, will be granted a Purchase Right to purchase up to that number of shares of Common Stock purchasable either with a percentage or with a maximum dollar amount, as designated by the Board, but in either case not exceeding 15% of such Employee's earnings (as defined by the Board in each Offering) during the period that begins on the Offering Date (or such later date as the Board determines for a particular Offering) and ends on the date stated in the Offering, which date will be no later than the end of the Offering.

(b) The Board will establish one or more Purchase Dates during an Offering on which Purchase Rights granted for that Offering will be exercised and shares of Common Stock will be purchased in accordance with such Offering.

(c) In connection with each Offering made under the Plan, the Board may specify (i) a maximum number of shares of Common Stock that may be purchased by any Participant on any Purchase Date during such Offering, (ii) a maximum aggregate number of shares of Common Stock that may be purchased by all Participants pursuant to such Offering and/or (iii) a maximum aggregate number of shares of Common Stock that may be purchased by all Participants on any Purchase Date under the Offering. If the aggregate purchase of shares of Common Stock issuable upon exercise of Purchase Rights granted under the Offering would exceed any such maximum aggregate number, then, in the absence of any Board action otherwise, a pro rata (based on each Participant's accumulated Contributions) allocation of the shares of Common Stock (rounded down to the nearest whole share) available will be made in as nearly a uniform manner as will be practicable and equitable.

(d) The purchase price of shares of Common Stock acquired pursuant to Purchase Rights will be not less than the lesser of:

(i) an amount equal to 85% of the Fair Market Value of the shares of Common Stock on the Offering Date; or

(ii) an amount equal to 85% of the Fair Market Value of the shares of Common Stock on the applicable Purchase Date.

7. PARTICIPATION; WITHDRAWAL; TERMINATION.

(a) An Eligible Employee may elect to participate in an Offering and authorize payroll deductions as the means of making Contributions by completing and delivering to the Company, within the time specified in the Offering, an enrollment form provided by the Company. The enrollment form will specify the amount of Contributions not to exceed the maximum amount specified by the Board. Each Participant's Contributions will be credited to a bookkeeping account for such Participant under the Plan and will be deposited with the general funds of the Company except where applicable law or regulations requires that Contributions be deposited with a third party. If permitted in the Offering, a Participant may begin such Contributions with the first payroll occurring on or after the Offering Date (or, in the case of a payroll date that occurs after the end of the prior Offering but before the Offering Date of the next new Offering, Contributions from such payroll will be included in the new Offering). If permitted in the Offering, a Participant may thereafter reduce (including to zero) or increase his or her Contributions. If required under applicable law or regulations or if specifically provided in the Offering, in addition to or instead of making Contributions by payroll deductions, a Participant may make Contributions through the payment by cash, check or wire transfer prior to a Purchase Date.

(b) During an Offering, a Participant may cease making Contributions and withdraw from the Offering by delivering to the Company a withdrawal form provided by the Company. The Company may impose a deadline before a Purchase Date for withdrawing. Upon such withdrawal, such Participant's Purchase Right in that Offering will immediately terminate and the Company will distribute as soon as practicable to such Participant all of his or her accumulated but unused Contributions and such Participant's Purchase Right in that Offering shall thereupon terminate. A Participant's withdrawal from that Offering will have no effect upon his or her eligibility to participate in any other Offerings under the Plan, but such Participant will be required to deliver a new enrollment form to participate in subsequent Offerings.

(c) Unless otherwise required by applicable law or regulations, Purchase Rights granted pursuant to any Offering under the Plan will terminate immediately if the Participant either (i) is no longer an Employee for any reason or for no reason (subject to any post-employment participation period required by law) or (ii) is otherwise no longer eligible to participate. The Company will distribute as soon as practicable to such individual all of his or her accumulated but unused Contributions.

(d) During a Participant's lifetime, Purchase Rights will be exercisable only by such Participant. Purchase Rights are not transferable by a Participant, except by will, by the laws of descent and distribution, or, if permitted by the Company, by a beneficiary designation as described in Section 10.

(e) Unless otherwise specified in the Offering or required by applicable law or regulations, the Company will have no obligation to pay interest on Contributions.

8. EXERCISE OF PURCHASE RIGHTS.

(a) On each Purchase Date, each Participant's accumulated Contributions will be applied to the purchase of shares of Common Stock, up to the maximum number of shares of Common Stock permitted by the Plan and the applicable Offering, at the purchase price specified in the Offering. No fractional shares will be issued unless specifically provided for in the Offering.

(b) Unless otherwise provided in the Offering, if any amount of accumulated Contributions remains in a Participant's account after the purchase of shares of Common Stock on the final Purchase Date of an Offering, then such remaining amount will not roll over to the next Offering and will instead be distributed in full to such Participant after the final Purchase Date of such Offering without interest (unless otherwise required by applicable law or regulations).

(c) No Purchase Rights may be exercised to any extent unless the shares of Common Stock to be issued upon such exercise under the Plan are covered by an effective registration statement pursuant to the Securities Act and the Plan is in material compliance with all applicable federal, state, foreign and other securities and other laws applicable to the Plan. If on a Purchase Date the shares of Common Stock are not so registered or the Plan is not in such compliance, no Purchase Rights will be exercised on such Purchase Date, and the Purchase Date

will be delayed until the shares of Common Stock are subject to such an effective registration statement and the Plan is in material compliance, except that the Purchase Date will in no event be more than 27 months from the Offering Date. If, on the Purchase Date, as delayed to the maximum extent permissible, the shares of Common Stock are not registered and the Plan is not in material compliance with all applicable laws and regulations, no Purchase Rights will be exercised and all accumulated but unused Contributions will be distributed to the Participants without interest.

9. COVENANTS OF THE COMPANY.

The Company will seek to obtain from each federal, state, foreign or other regulatory commission or agency having jurisdiction over the Plan such authority as may be required to grant Purchase Rights and issue and sell shares of Common Stock thereunder unless the Company determines, in its sole discretion, that doing so would cause the Company to incur costs that are unreasonable. If, after commercially reasonable efforts, the Company is unable to obtain the authority that counsel for the Company deems necessary for the grant of Purchase Rights or the lawful issuance and sale of Common Stock under the Plan, and at a commercially reasonable cost, the Company will be relieved from any liability for failure to grant Purchase Rights and/or to issue and sell Common Stock upon exercise of such Purchase Rights.

10. DESIGNATION OF BENEFICIARY.

(a) The Company may, but is not obligated to, permit a Participant to submit a form designating a beneficiary who will receive any shares of Common Stock and/or Contributions from the Participant's account under the Plan if the Participant dies before such shares and/or Contributions are delivered to the Participant. The Company may, but is not obligated to, permit the Participant to change such designation of beneficiary. Any such designation and/or change must be on a form approved by the Company.

(b) If a Participant dies, and in the absence of a valid beneficiary designation, the Company will deliver any shares of Common Stock and/or Contributions to the executor or administrator of the estate of the Participant. If no executor or administrator has been appointed (to the knowledge of the Company), the Company, in its sole discretion, may deliver such shares of Common Stock and/or Contributions, without interest, to the Participant's spouse, dependents or relatives, or if no spouse, dependent or relative is known to the Company, then to such other person as the Company may designate.

11. ADJUSTMENTS UPON CHANGES IN COMMON STOCK; CORPORATE TRANSACTIONS.

(a) In the event of a Capitalization Adjustment, the Board will appropriately and proportionately adjust: (i) the class(es) and maximum number of securities subject to the Plan pursuant to Section 3(a), (ii) the class(es) and maximum number of securities by which the share reserve is to increase automatically each year pursuant to Section 3(a), (iii) the class(es) and number of securities subject to, and the purchase price applicable to outstanding Offerings and Purchase Rights, and (iv) the class(es) and number of securities that are the subject of the purchase limits under each ongoing Offering. The Board will make these adjustments, and its determination will be final, binding and conclusive.

(b) In the event of a Corporate Transaction, then: (i) any surviving corporation or acquiring corporation (or the surviving or acquiring corporation's parent company) may assume or continue outstanding Purchase Rights or may substitute similar rights (including a right to acquire the same consideration paid to the stockholders in the Corporate Transaction) for outstanding Purchase Rights, or (ii) if any surviving or acquiring corporation (or its parent company) does not assume or continue such Purchase Rights or does not substitute similar rights for such Purchase Rights, then the Participants' accumulated Contributions will be used to purchase shares of Common Stock (rounded down to the nearest whole share) within ten business days prior to the Corporate Transaction under the outstanding Purchase Rights, and the Purchase Rights will terminate immediately after such purchase.

12. AMENDMENT, TERMINATION OR SUSPENSION OF THE PLAN.

(a) The Board may amend the Plan at any time in any respect the Board deems necessary or advisable. However, except as provided in Section 11(a) relating to Capitalization Adjustments, stockholder approval will be required for any amendment of the Plan for which stockholder approval is required by applicable law, regulations or listing requirements.

(b) The Board may suspend or terminate the Plan at any time. No Purchase Rights may be granted under the Plan while the Plan is suspended or after it is terminated.

(c) Any benefits, privileges, entitlements and obligations under any outstanding Purchase Rights granted before an amendment, suspension or termination of the Plan will not be materially impaired by any such amendment, suspension or termination except (i) with the consent of the person to whom such Purchase Rights were granted, (ii) as necessary to comply with any laws, listing requirements, or governmental regulations (including, without limitation, the provisions of Section 423 of the Code and the regulations and other interpretive guidance issued thereunder relating to Employee Stock Purchase Plans) including without limitation any such regulations or other guidance that may be issued or amended after the date the Plan is adopted by the Board, or (iii) as necessary to obtain or maintain favorable tax, listing, or regulatory treatment. To be clear, the Board may amend outstanding Purchase Rights without a Participant's consent if such amendment is necessary to ensure that the Purchase Right and/or the Plan complies with the requirements of Section 423 of the Code.

13. EFFECTIVE DATE OF PLAN.

The Plan will become effective immediately prior to and contingent upon the IPO Date. No Purchase Rights will be exercised unless and until the Plan has been approved by the stockholders of the Company, which approval must be within 12 months before or after the date the Plan is adopted (or if required under Section 12(a) above, materially amended) by the Board.

14. MISCELLANEOUS PROVISIONS.

(a) Proceeds from the sale of shares of Common Stock pursuant to Purchase Rights will constitute general funds of the Company.

(b) A Participant will not be deemed to be the holder of, or to have any of the rights of a holder with respect to, shares of Common Stock subject to Purchase Rights unless and until. the Participant's shares of Common Stock acquired upon exercise of Purchase Rights are recorded in the books of the Company (or its transfer agent).

(c) The Plan and Offering do not constitute an employment contract. Nothing in the Plan or in the Offering will in any way alter the at will nature of a Participant's employment, if applicable, or be deemed to create in any way whatsoever any obligation on the part of any Participant to continue in the employ of the Company or a Related Corporation, or on the part of the Company or a Related Corporation to continue the employment of a Participant.

(d) The provisions of the Plan will be governed by the laws of the State of Delaware without resort to that state's conflicts of laws rules.

(e) If any particular provision of the Plan is found to be invalid or otherwise unenforceable, such provision will not affect the other provisions of the Plan, but the Plan will be construed in all respects as if such invalid provision were omitted.

(f) If any provision of the Plan does not comply with applicable law or regulations, such provision shall be construed in such a manner as to comply with applicable law or regulations.

15. DEFINITIONS.

As used in the Plan, the following definitions will apply to the capitalized terms indicated below:

(a) "***Board***" means the Board of Directors of the Company.

(b) "***Capital Stock***" means each and every class of common stock of the Company, regardless of the number of votes per share.

(c) "***Capitalization Adjustment***" means any change that is made in, or other events that occur with respect to, the Common Stock subject to the Plan or subject to any Purchase Right after the date the Plan is adopted by the Board without the receipt of consideration by the Company through merger, consolidation, reorganization, recapitalization, reincorporation, stock dividend, dividend in property other than cash, large nonrecurring cash dividend, stock split, liquidating dividend, combination of shares, exchange of shares, change in corporate structure or other similar equity restructuring transaction, as that term is used in Financial Accounting Standards Board Accounting Standards Codification Topic 718 (or any successor thereto). Notwithstanding the foregoing, the conversion of any convertible securities of the Company will not be treated as a Capitalization Adjustment.

(d) "***Code***" means the Internal Revenue Code of 1986, as amended, including any applicable regulations and guidance thereunder.

(e) "***Committee***" means a committee of one or more members of the Board to whom authority has been delegated by the Board in accordance with Section 2(c).

(f) "***Common Stock***" means, as of the IPO Date, the common stock of the Company, having one vote per share.

(g) "***Company***" means Personalis, Inc., a Delaware corporation.

(h) ***"Contributions***" means the payroll deductions and other additional payments specifically provided for in the Offering that a Participant contributes to fund the exercise of a Purchase Right. A Participant may make additional payments into his or her account if specifically provided for in the Offering, and then only if the Participant has not already had the maximum permitted amount withheld during the Offering through payroll deductions.

(i) "***Corporate Transaction***" means the consummation, in a single transaction or in a series of related transactions, of any one or more of the following events:

(i) a sale or other disposition of all or substantially all, as determined by the Board in its sole discretion, of the consolidated assets of the Company and its Subsidiaries;

(ii) a sale or other disposition of more than 50% of the outstanding securities of the Company;

(iii) a merger, consolidation or similar transaction following which the Company is not the surviving corporation; or

(iv) a merger, consolidation or similar transaction following which the Company is the surviving corporation but the shares of Common Stock outstanding immediately preceding the merger, consolidation or similar transaction are converted or exchanged by virtue of the merger, consolidation or similar transaction into other property, whether in the form of securities, cash or otherwise.

(j) "***Director***" means a member of the Board.

(k) "***Eligible Employee***" means an Employee who meets the requirements set forth in the document(s) governing the Offering for eligibility to participate in the Offering, provided that such Employee also meets the requirements for eligibility to participate set forth in the Plan.

(l) "***Employee***" means any person, including an Officer or Director, who is "employed" for purposes of Section 423(b)(4) of the Code by the Company or a Related Corporation. However, service solely as a Director, or payment of a fee for such services, will not cause a Director to be considered an "Employee" for purposes of the Plan.

(m) "***Employee Stock Purchase Plan***" means a plan that grants Purchase Rights intended to be options issued under an "employee stock purchase plan," as that term is defined in Section 423(b) of the Code.

(n) "***Exchange Act***" means the Securities Exchange Act of 1934, as amended and the rules and regulations promulgated thereunder.

(o) "***Fair Market Value***" means, as of any date, the value of the Common Stock determined as follows:

(i) If the Common Stock is listed on any established stock exchange or traded on any established market, the Fair Market Value of a share of Common Stock will be the closing sales price for such stock as quoted on such exchange or market (or the exchange or market with the greatest volume of trading in the Common Stock) on the date of determination, as reported in such source as the Board deems reliable. Unless otherwise provided by the Board, if there is no closing sales price for the Common Stock on the date of determination, then the Fair Market Value will be the closing sales price on the last preceding date for which such quotation exists.

(ii) In the absence of such markets for the Common Stock, the Fair Market Value will be determined by the Board in good faith in compliance with applicable laws and regulations and in a manner that complies with Sections 409A of the Code

(iii) Notwithstanding the foregoing, for any Offering that commences on the IPO Date, the Fair Market Value of the shares of Common Stock on the Offering Date will be the price per share at which shares are first sold to the public in the Company's initial public offering as specified in the final prospectus for that initial public offering.

(p) "***IPO Date***" means the date of the underwriting agreement between the Company and the underwriters managing the initial public offering of the Common Stock, pursuant to which the Common Stock is priced for the initial public offering.

(q) "***Offering***" means the grant to Eligible Employees of Purchase Rights, with the exercise of those Purchase Rights automatically occurring at the end of one or more Purchase Periods. The terms and conditions of an Offering will generally be set forth in the "***Offering Document***" approved by the Board for that Offering.

(r) "***Offering Date***" means a date selected by the Board for an Offering to commence.

(s) "***Officer***" means a person who is an officer of the Company or a Related Corporation within the meaning of Section 16 of the Exchange Act.

(t) "***Participant***" means an Eligible Employee who holds an outstanding Purchase Right.

(u) "***Plan***" means this Personalis, Inc. 2019 Employee Stock Purchase Plan.

(v) "***Purchase Date***" means one or more dates during an Offering selected by the Board on which Purchase Rights will be exercised and on which purchases of shares of Common Stock will be carried out in accordance with such Offering.

(w) "***Purchase Period***" means a period of time specified within an Offering, generally beginning on the Offering Date or on the first Trading Day following a Purchase Date, and ending on a Purchase Date. An Offering may consist of one or more Purchase Periods.

(x) "***Purchase Right***" means an option to purchase shares of Common Stock granted pursuant to the Plan.

(y) "***Related Corporation***" means any "parent corporation" or "subsidiary corporation" of the Company whether now or subsequently established, as those terms are defined in Sections 424(e) and (f), respectively, of the Code.

(z) "***Securities Act***" means the Securities Act of 1933, as amended.

(aa) "***Trading Day*** " means any day on which the exchange(s) or market(s) on which shares of Common Stock are listed, including but not limited to the NYSE, Nasdaq Global Select Market, the Nasdaq Global Market, the Nasdaq Capital Market or any successors thereto, is open for trading.

Exhibit 10.4

PERSONALIS, INC.

INDEMNITY AGREEMENT

THIS INDEMNITY AGREEMENT (the "**Agreement**") is made and entered into as of , between Personalis, Inc., a Delaware corporation (the "**Company**"), and ("**Indemnitee**").

RECITALS

A. Highly competent persons have become more reluctant to serve corporations as directors or officers or in other capacities unless they are provided with adequate protection through insurance or adequate indemnification against inordinate risks of claims and actions against them arising out of their service to and activities on behalf of the corporation;

B. Although furnishing of insurance to protect persons serving a corporation and its subsidiaries from certain liabilities has been a customary and widespread practice among U.S.-based corporations and other business enterprises, the Company believes that, given current market conditions and trends, such insurance may be available to it in the future only at higher premiums and with more exclusions. At the same time, directors, officers, and other persons in service to corporations or business enterprises are being increasingly subjected to expensive and time-consuming litigation relating to, among other things, matters that traditionally would have been brought only against the Company or business enterprise itself. The Company's Bylaws (the "**Bylaws**") and the Company's Certificate of Incorporation (the "**Certificate of Incorporation**") require indemnification of the Company's executive officers and directors and permit indemnification of certain other officers and persons. Indemnitee may also be entitled to indemnification pursuant to the General Corporation Law of the State of Delaware (the "**DGCL**"). The Bylaws, the Certificate of Incorporation and the DGCL expressly provide that their respective indemnification provisions are not exclusive, and contemplate that contracts may be entered into between the Company and its officers, members of the Board and other persons with respect to indemnification;

C. The uncertainties relating to such liability insurance and to indemnification have increased the difficulty of attracting and retaining such persons;

D. The Board has determined that the increased difficulty in attracting and retaining such persons is detrimental to the best interests of the Company and its stockholders, and that the Company should act to assure such persons that there will be increased certainty of protection in the future;

E. It is reasonable, prudent and necessary for the Company to contractually obligate itself to indemnify, and to advance expenses on behalf of, such persons to the fullest extent permitted by applicable law so that they will serve or continue to serve the Company free from undue concern that they will not be so indemnified;

F. This Agreement is a supplement to and in furtherance of the Bylaws, the Certificate of Incorporation and any resolutions adopted pursuant to such indemnification, and will not be deemed a substitute therefor, nor to diminish or abrogate any rights of Indemnitee;

G. Indemnitee does not regard the protection available under the Bylaws, the Certificate of Incorporation and insurance as adequate in the present circumstances, and may not be willing to serve as an officer or director without adequate protection, and the Company desires Indemnitee to serve in such capacity. Indemnitee is willing to serve, continue to serve and/or to take on additional service for or on behalf of the Company on the condition that he or she be so indemnified;

H. Indemnitee may have certain rights to indemnification and insurance provided by other entities or organizations which Indemnitee and such other entities and organizations intend to be secondary to the primary obligation of the Company to indemnify Indemnitee as provided in this Agreement, with the Company's acknowledgement and agreement to the foregoing being a material condition to Indemnitee's willingness to serve on the Board; and

I. This Agreement supersedes and replaces in its entirety any previous indemnification agreement entered into between the Company and Indemnitee.

NOW, THEREFORE, in consideration of Indemnitee's agreement to serve as an officer and/or a director from and after the date first written above, the parties agree as follows:

1. Indemnity of Indemnitee. The Company agrees to hold harmless and indemnify Indemnitee to the fullest extent permitted by law, as such may be amended from time to time in accordance with the terms of this Agreement. In furtherance of this indemnification, and without limiting the generality of such indemnification:

(a) Proceedings Other Than Proceedings by or in the Right of the Company. Indemnitee will be entitled to the rights of indemnification provided in this Section 1(a) if, by reason of his or her Corporate Status, Indemnitee is, or is threatened to be made, a party to or participant in any Proceeding other than a Proceeding by or in the right of the Company. Pursuant to this Section 1(a), Indemnitee will be indemnified against all Expenses, judgments, penalties, fines and amounts paid in settlement actually and reasonably incurred by him or her, or on his or her behalf, in connection with such Proceeding or any claim, issue or matter. This indemnification is provided if Indemnitee acted in good faith and in a manner Indemnitee reasonably believed to be in or not opposed to the best interests of the Company, and with respect to any criminal Proceeding, had no reasonable cause to believe Indemnitee's conduct was unlawful.

(b) Proceedings by or in the Right of the Company. Indemnitee will be entitled to the rights of indemnification provided in this Section 1(b) if, by reason of his or her Corporate Status, Indemnitee is, or is threatened to be made, a party to or participant in any Proceeding brought by or in the right of the Company. Pursuant to this Section 1(b), Indemnitee will be indemnified against all Expenses actually and reasonably incurred by Indemnitee, or on Indemnitee's behalf, in connection with such Proceeding if Indemnitee acted in good faith and in a manner Indemnitee reasonably believed to be in, or not opposed to, the best interests of the

Company. Indemnification will not be provided against such Expenses if made in respect of any claim, issue or matter in such Proceeding as to which Indemnitee will have been adjudged to be liable to the Company unless and to the extent that the Court of Chancery of the State of Delaware will determine that such indemnification may be made.

(c) Indemnification for Expenses of a Party Who is Wholly or Partly Successful. Notwithstanding any other provision of this Agreement, to the extent that Indemnitee is, by reason of his or her Corporate Status, a party to and is successful, on the merits or otherwise, in any Proceeding, he or she will be indemnified to the maximum extent permitted by law against all Expenses actually and reasonably incurred by him or her or on his or her behalf in connection therewith. If Indemnitee is not wholly successful in such Proceeding but is successful, on the merits or otherwise, as to one or more but less than all claims, issues or matters in such Proceeding, the Company will indemnify Indemnitee against all Expenses actually and reasonably incurred by him or her or on his or her behalf in connection with each successfully resolved claim, issue or matter. For purposes of this Section 1(c), the termination of any claim, issue or matter in such a Proceeding by dismissal, with or without prejudice, will be deemed to be a successful result as to such claim, issue or matter.

2. Additional Indemnity. In addition to, and without regard to any limitations on, the indemnification provided for in Section 1, the Company agrees to indemnify and hold Indemnitee harmless against all Expenses, judgments, penalties, fines and amounts paid in settlement actually and reasonably incurred by him or her or on his or her behalf if, by reason of his or her Corporate Status, he or she is, or is threatened to be made, a party to or participant in any Proceeding (including a Proceeding by or in the right of the Company), including, without limitation, any and all liability arising out of the negligence or active or passive wrongdoing of Indemnitee. The only limitation that will exist on the Company's obligations pursuant to this Agreement will be that the Company will not be obligated to make any payment to Indemnitee that is finally determined (under the procedures, and subject to the presumptions, in Sections 6 and 7) to be unlawful.

3. Contribution.

(a) Whether or not the indemnification provided in Sections 1 and 2 is available, in respect of any threatened, pending or completed action, suit or proceeding in which the Company is jointly liable with Indemnitee (or would be if joined in such action, suit or proceeding), the Company will pay, in the first instance, the entire amount of any judgment or settlement of such action, suit or proceeding without requiring Indemnitee to contribute to such payment, and the Company waives and relinquishes any right of contribution it may have against Indemnitee. The Company will not enter into any settlement of any action, suit or proceeding in which the Company is jointly liable with Indemnitee (or would be if joined in such action, suit or proceeding) unless such settlement provides for a full and final release of all claims asserted against Indemnitee. The Company will not settle any action or claim in a manner that would impose any penalty or admission of guilt or liability on Indemnitee without Indemnitee's written consent.

(b) Without diminishing or impairing the obligations of the Company in the preceding subparagraph, if Indemnitee elects or is required to pay all or any portion of any judgment or settlement in any threatened, pending or completed action, suit or proceeding in which the Company is jointly liable with Indemnitee (or would be if joined in such action, suit or proceeding), the Company will contribute to the amount of Expenses, judgments, fines and amounts paid in settlement actually and reasonably incurred and paid or payable by Indemnitee in proportion to the relative benefits received by the Company and all its officers, directors or employees, other than Indemnitee, who are jointly liable with Indemnitee (or would be if joined in such action, suit or proceeding), on the one hand, and Indemnitee, on the other hand, from the transaction from which such action, suit or proceeding arose. To the extent necessary to conform to law, the proportion determined on the basis of relative benefit may be further adjusted by reference to the relative fault of the Company and all its officers, directors or employees, other than Indemnitee, who are jointly liable with Indemnitee (or would be if joined in such action, suit or proceeding), on the one hand, and Indemnitee, on the other hand, in connection with the events that resulted in such expenses, judgments, fines or settlement amounts, as well as any other equitable considerations which the applicable law may require to be considered. The relative fault of the Company and all its officers, directors or employees, other than Indemnitee, who are jointly liable with Indemnitee (or would be if joined in such action, suit or proceeding), on the one hand, and Indemnitee, on the other hand, will be determined by reference to, among other things, the degree to which their actions were motivated by intent to gain personal profit or advantage, the degree to which their liability is primary or secondary and the degree to which their respective conduct is active or passive.

(c) The Company agrees to fully indemnify and hold Indemnitee harmless from any claims of contribution that may be brought by the Company's officers, directors or employees, other than Indemnitee, who may be jointly liable with Indemnitee.

(d) To the fullest extent permissible under applicable law, if the indemnification provided for in this Agreement is unavailable to Indemnitee for any reason whatsoever, the Company, in lieu of indemnifying Indemnitee, will contribute to the amount incurred by Indemnitee, whether for judgments, fines, penalties, excise taxes, amounts paid or to be paid in settlement or for Expenses, in connection with any claim relating to an indemnifiable event under this Agreement, in such proportion as is deemed fair and reasonable in light of all of the circumstances of such Proceeding to reflect: (i) the relative benefits received by the Company and Indemnitee as a result of the events and transactions giving cause to such Proceeding; and (ii) the relative fault of the Company (and its directors, officers, employees and agents) and Indemnitee in connection with such events and transactions.

4. Indemnification for Expenses of a Witness. Notwithstanding any other provision of this Agreement, to the extent that Indemnitee is, by reason of his or her Corporate Status, a witness, or is made (or asked) to respond to discovery requests, in any Proceeding to which Indemnitee is not a party, he or she will be indemnified against all Expenses actually and reasonably incurred by him or her or on his or her behalf in connection therewith.

5. Advancement of Expenses. Notwithstanding any other provision of this Agreement, the Company will advance all Expenses incurred by or on behalf of Indemnitee in connection with any Proceeding by reason of Indemnitee's Corporate Status within 30 days after the receipt by the Company of a statement from Indemnitee requesting such advance or advances, whether prior to or after final disposition of such Proceeding. Such statement will reasonably evidence the Expenses incurred by Indemnitee and will include or be preceded or accompanied by a written undertaking by or on behalf of Indemnitee to repay any Expenses advanced if it is ultimately determined that Indemnitee is not entitled to be indemnified against such Expenses. Any advances and undertakings to repay pursuant to this Section 5 will be unsecured and interest free.

6. Procedures and Presumptions for Determination of Entitlement to Indemnification. It is the intent of this Agreement to secure for Indemnitee rights of indemnity that are as favorable as may be permitted under the DGCL and public policy of the State of Delaware. Accordingly, the parties agree that the following procedures and presumptions will apply in the event of any question as to whether Indemnitee is entitled to indemnification under this Agreement:

(a) To obtain indemnification under this Agreement, Indemnitee will submit to the Company a written request with such documentation and information as is reasonably available to Indemnitee and is reasonably necessary to determine whether and to what extent Indemnitee is entitled to indemnification. The Secretary of the Company will, promptly on receipt of such a request for indemnification, advise the Board in writing that Indemnitee has requested indemnification. Notwithstanding the foregoing, any failure of Indemnitee to provide such request to the Company, or to provide such a request in a timely fashion, will not relieve the Company of any liability that it may have to Indemnitee unless, and to the extent that, such failure actually and materially prejudices the interests of the Company.

(b) On written request by Indemnitee for indemnification pursuant to the first sentence of Section 6(a), Indemnitee's entitlement to indemnification will be determined in the specific case:

(i) by one of the following four methods, which will be at the election of the Board, unless a Change in Control has occurred:

(a) by a majority vote of the Disinterested Directors, even though less than a quorum;

(b) by a committee of Disinterested Directors designated by a majority vote of the Disinterested Directors, even though less than a quorum;

(c) if there are no Disinterested Directors or if the Disinterested Directors so direct, by Independent Counsel in a written opinion to the Board, a copy of which will be delivered to Indemnitee; or

(d) if so directed by the Board, by the Company's stockholders; or

(ii) if a Change in Control has occurred, by Independent Counsel in a written opinion to the Board, a copy of which will be delivered to Indemnitee.

(c) If the determination of entitlement to indemnification is to be made by Independent Counsel pursuant to Section 6(b), the Independent Counsel will be selected as provided in this Section 6(c). The Independent Counsel will be selected by the Board and the Board will notify Indemnitee by written notice. Within ten days after such notice has been given, Indemnitee may deliver to the Company a written objection to such selection. However, that objection may only be asserted on the ground that the Independent Counsel does not meet the requirements of "**Independent Counsel**" as set forth in Section 13, and the objection will include with particularity the factual basis of such assertion. Absent a proper and timely objection, the person so selected will act as Independent Counsel. If a written objection is made and substantiated, the Independent Counsel selected may not serve as Independent Counsel unless and until such objection is withdrawn or a court has determined that such objection is without merit. If no Independent Counsel has been selected and not objected to within 20 days after submission by Indemnitee of a written request for indemnification pursuant to Section 6(a), either the Company or Indemnitee may petition the Court of Chancery of the State of Delaware or other court of competent jurisdiction for resolution of any objection made by Indemnitee to the Company's selection of Independent Counsel or for the appointment of a person selected by the court or by such other person as the court designates to serve as Independent Counsel. The person with respect to whom all objections are so resolved or the person so appointed will act as Independent Counsel under Section 6(b). The Company will pay any and all reasonable fees and expenses of the Independent Counsel incurred by such Independent Counsel in connection with acting pursuant to Section 6(b), and the Company will pay all reasonable fees and expenses incident to the procedures of this Section 6(c), regardless of the manner in which such Independent Counsel was selected or appointed. In no event will Indemnitee be liable for fees and expenses incurred by such Independent Counsel.

(d) In making a determination with respect to entitlement to indemnification under this Agreement, the person, persons or entity making such determination will presume that Indemnitee is entitled to indemnification under this Agreement. Anyone seeking to overcome this presumption will have the burden of proof and the burden of persuasion by clear and convincing evidence. Neither the failure of the Company (including by the Board or Independent Counsel) to have made a determination prior to the commencement of any action pursuant to this Agreement that indemnification is proper in the circumstances because Indemnitee has met the applicable standard of conduct, nor an actual determination by the Company (including by the Board or Independent Counsel) that Indemnitee has not met such applicable standard of conduct, will be a defense to the action or create a presumption that Indemnitee has not met the applicable standard of conduct.

(e) Indemnitee will be deemed to have acted in good faith if Indemnitee's action is based on the records or books of account of the Enterprise, including financial statements, or on information supplied to Indemnitee by the officers of the Enterprise in the course of their duties, or on the advice of legal counsel for the Enterprise or on information or records given or reports made to the Enterprise by an independent certified public accountant or by an appraiser or other expert selected with reasonable care by the Enterprise. In addition, the knowledge and actions, or failure to act, of any director, officer, agent or employee of the Enterprise will not be imputed to Indemnitee for purposes of determining the right to indemnification under this Agreement. Whether or not the foregoing provisions of this Section 6(e) are satisfied, it will in any event be presumed that Indemnitee has at all times acted in good faith and in a manner he or she reasonably believed to be in, or not opposed to, the best interests of the Company. Anyone seeking to overcome this presumption will have the burden of proof and the burden of persuasion by clear and convincing evidence.

(f) If the person, persons or entity empowered or selected under Section 6 to determine whether Indemnitee is entitled to indemnification has not made a determination within 60 days after receipt by the Company of the request, the requisite determination of entitlement to indemnification will be deemed to have been made, and Indemnitee will be entitled to such indemnification absent (i) a misstatement by Indemnitee of a material fact or an omission of a material fact necessary to make Indemnitee's statement not materially misleading in connection with the request for indemnification or (ii) a prohibition of such indemnification under applicable law. Such 60-day period may be extended for a reasonable time, not to exceed an additional 30 days, if the person, persons or entity making such determination with respect to entitlement to indemnification in good faith requires such additional time to obtain or evaluate documentation or information relating thereto. The provisions of this Section 6(f) will not apply if the determination of entitlement to indemnification is to be made by the Company's stockholders pursuant to Section 6(b) and if (A) within 15 days after receipt by the Company of the request for such determination, the Board or the Disinterested Directors, if appropriate, resolve to submit such determination to the Company's stockholders for their consideration at an annual meeting to be held within 75 days after such receipt, and such determination is made at that annual meeting, or (B) a special meeting of the Company's stockholders is called within 15 days after such receipt for the purpose of making such determination, such meeting is held for such purpose within 60 days after having been so called and such determination is made at that special meeting.

(g) Indemnitee will cooperate with the person, persons or entity making such determination with respect to Indemnitee's entitlement to indemnification, including providing such person, persons or entity, on reasonable advance request, any documentation or information which is not privileged or otherwise protected from disclosure and which is reasonably available to Indemnitee and reasonably necessary to such determination. Any Independent Counsel, member of the Board or stockholder of the Company will act reasonably and in good faith in making a determination regarding Indemnitee's entitlement to indemnification under this Agreement. Any costs or expenses (including attorneys' fees and disbursements) incurred by Indemnitee in so cooperating with the person, persons or entity making such determination will be borne by the Company (irrespective of the determination as to Indemnitee's entitlement to indemnification), and the Company indemnifies and agrees to hold Indemnitee harmless therefrom.

(h) The Company acknowledges that a settlement or other disposition short of final judgment may be successful if it permits a party to avoid expense, delay, distraction, disruption and uncertainty. In the event that any action, claim or proceeding to which Indemnitee is a party is resolved in any manner other than by adverse judgment against Indemnitee (including, without limitation, settlement of such action, claim or proceeding with or without payment of money or other consideration) it will be presumed that Indemnitee has been successful on the merits or otherwise in such action, suit or proceeding. Anyone seeking to overcome this presumption will have the burden of proof and the burden of persuasion by clear and convincing evidence.

(i) The termination of any Proceeding or of any claim, issue or matter in any Proceeding, by judgment, order settlement or conviction, or on a plea of nolo contendere or its equivalent, will not (except as otherwise expressly provided in this Agreement) of itself adversely affect the right of Indemnitee to indemnification or create a presumption that Indemnitee did not act in good faith and in a manner which he or she reasonably believed to be in or not opposed to the best interests of the Company or, with respect to any criminal Proceeding, that Indemnitee had reasonable cause to believe that his or her conduct was unlawful.

7. Remedies of Indemnitee.

(a) In the event that (i) a determination is made pursuant to Section 6 that Indemnitee is not entitled to indemnification under this Agreement, (ii) advancement of Expenses is not timely made pursuant to Section 5, (iii) subject to the limitations set forth herein, no determination of entitlement to indemnification is made pursuant to Section 6(b) within 90 days after receipt by the Company of the request for indemnification, (iv) payment of indemnification is not made pursuant to this Agreement within ten days after receipt by the Company of a written request for such payment or (v) payment of indemnification is not made within ten days after a determination has been made that Indemnitee is entitled to indemnification or such determination is deemed to have been made pursuant to Section 6, Indemnitee will be entitled to an adjudication in an appropriate court of the State of Delaware, or in any other court of competent jurisdiction, of Indemnitee's entitlement to such indemnification. Indemnitee will commence such proceeding seeking an adjudication within one year following the date on which Indemnitee first has the right to commence such proceeding pursuant to this Section 7(a). The Company will not oppose Indemnitee's right to seek any such adjudication.

(b) In the event that a determination has been made pursuant to Section 6(b) that Indemnitee is not entitled to indemnification, any judicial proceeding commenced pursuant to this Section 7 will be conducted in all respects as a de novo trial on the merits, and Indemnitee will not be prejudiced by reason of the adverse determination under Section 6(b).

(c) If a determination has been made pursuant to Section 6(b) that Indemnitee is entitled to indemnification, the Company will be bound by such determination in any judicial proceeding commenced pursuant to this Section 7, absent (i) a misstatement by Indemnitee of a material fact or an omission of a material fact necessary to make Indemnitee's misstatement not materially misleading in connection with the application for indemnification or (ii) a prohibition of such indemnification under applicable law.

(d) In the event that Indemnitee, pursuant to this Section 7, seeks a judicial adjudication of his or her rights under, or to recover damages for breach of, this Agreement, or to recover under any directors' and officers' liability insurance policies maintained by the Company, the Company will pay on his or her behalf, in advance, any and all expenses (of the types described in the definition of Expenses) actually and reasonably incurred by him or her in such judicial adjudication, regardless of whether Indemnitee ultimately is determined to be entitled to such indemnification, advancement of expenses or insurance recovery.

(e) The Company will be precluded from asserting in any judicial proceeding commenced pursuant to this Section 7 that the procedures and presumptions of this Agreement are not valid, binding and enforceable, and will stipulate in any such court that the Company is bound by all the provisions of this Agreement. The Company will indemnify Indemnitee against any and

all Expenses and, if requested by Indemnitee, will (within ten days after receipt by the Company of a written request therefore) advance, to the extent not prohibited by law, such expenses to Indemnitee, which are incurred by Indemnitee in connection with any action brought by Indemnitee for indemnification or advance of Expenses from the Company under this Agreement or under any directors' and officers' liability insurance policies maintained by the Company, regardless of whether Indemnitee ultimately is determined to be entitled to such indemnification, advancement of Expenses or insurance recovery, as the case may be.

(f) Notwithstanding anything in this Agreement to the contrary, no determination as to entitlement to indemnification under this Agreement will be required to be made prior to the final disposition of the Proceeding.

8. Non-Exclusivity; Survival of Rights; Insurance; Primacy of Indemnification; Subrogation.

(a) The rights of indemnification as provided by this Agreement will not be deemed exclusive of any other rights to which Indemnitee may at any time be entitled under applicable law, the Certificate of Incorporation, the Bylaws, any agreement, a vote of the Company's stockholders, a resolution of Board or otherwise. No amendment, alteration or repeal of this Agreement or of any provision of this Agreement will limit or restrict any right of Indemnitee under this Agreement in respect of any action taken or omitted by Indemnitee in his or her Corporate Status prior to such amendment, alteration or repeal. To the extent that a change in the DGCL, whether by statute or judicial decision, permits greater indemnification than would be afforded currently under the Certificate of Incorporation, the Bylaws and this Agreement, it is the intent of the parties of this Agreement that Indemnitee will enjoy all greater benefits so afforded by such change. No right or remedy in this Agreement conferred is intended to be exclusive of any other right or remedy, and every other right and remedy will be cumulative and in addition to every other right and remedy given under this Agreement or now or hereafter existing at law, in equity or otherwise. The assertion or employment of any right or remedy, under this Agreement or otherwise, will not prevent the concurrent assertion or employment of any other right or remedy.

(b) To the extent that the Company maintains an insurance policy or policies providing liability insurance for directors, officers, employees, agents or fiduciaries of the Company or of any other corporation, partnership, joint venture, trust, employee benefit plan or other enterprise that serves at the request of the Company, the Company will procure such insurance policy or policies under which Indemnitee will be covered in accordance with its or their terms to the maximum extent of the coverage available for any director, officer, employee, agent or fiduciary under such policy or policies. If, at the time of the receipt of a notice of a claim pursuant to the terms of this Agreement, the Company has director and officer liability insurance in effect, the Company will give prompt notice of the commencement of such proceeding to the insurers in accordance with the procedures in the respective policies. The Company will thereafter take all necessary or desirable action to cause such insurers to pay, on behalf of Indemnitee, all amounts payable as a result of such proceeding in accordance with the terms of such policies.

(c) The Company acknowledges that Indemnitee has or may have in the future certain rights to indemnification, advancement of expenses or insurance provided by other entities or organizations (collectively, the "**Secondary Indemnitors**"). The Company agrees that (i) it is the indemnitor of first resort (i.e., its obligations to Indemnitee are primary and any obligation of the Secondary Indemnitors to advance expenses or to provide indemnification for the same expenses or liabilities incurred by Indemnitee are secondary), (ii) it will be required to advance the full amount of expenses incurred by Indemnitee and will be liable for the full amount of all Expenses, judgments, penalties, fines and amounts paid in settlement to the extent legally permitted and as required by the terms of this Agreement, the Certificate of Incorporation or the Bylaws (or any other agreement between the Company and Indemnitee), without regard to any rights Indemnitee may have against the Secondary Indemnitors, and (iii) it irrevocably waives, relinquishes and releases the Secondary Indemnitors from any and all claims against the Secondary Indemnitors for contribution, subrogation or any other recovery of any kind in respect thereof. The Company further agrees that no advancement or payment by the Secondary Indemnitors on behalf of Indemnitee with respect to any claim for which Indemnitee has sought indemnification from the Company will affect the foregoing and the Secondary Indemnitors will have a right of contribution and be subrogated to the extent of such advancement or payment to all of the rights of recovery of Indemnitee against the Company. The Company and Indemnitee agree that the Secondary Indemnitors are express third-party beneficiaries of the terms of this Section 8(c).

(d) Except as provided in Section 8(c), in the event of any payment under this Agreement, the Company will be subrogated to the extent of such payment to all of the rights of recovery of Indemnitee (other than against the Secondary Indemnitors), who will execute all papers required and take all action necessary to secure such rights, including execution of such documents as are necessary to enable the Company to bring suit to enforce such rights.

(e) Except as provided in Section 8(c), the Company will not be liable under this Agreement to make any payment of amounts otherwise indemnifiable under this Agreement if and to the extent that Indemnitee has otherwise actually received such payment under any insurance policy, contract, agreement or otherwise.

(f) Except as provided in Section 8(c), the Company's obligation to indemnify or advance Expenses under this Agreement to Indemnitee who is or was serving at the request of the Company as a director, officer, employee or agent of any other corporation, partnership, joint venture, trust, employee benefit plan or other enterprise will be reduced by any amount Indemnitee has actually received as indemnification or advancement of expenses from such other corporation, partnership, joint venture, trust, employee benefit plan or other enterprise.

9. Exceptions to Right of Indemnification. Notwithstanding any provision in this Agreement, the Company will not be obligated under this Agreement to make any indemnity in connection with any claim made against Indemnitee:

(a) for which payment has actually been made to or on behalf of Indemnitee under any insurance policy or other indemnity provision, except with respect to any excess beyond the amount paid under any insurance policy or other indemnity provision, provided, that the foregoing will not affect the rights of Indemnitee or the Secondary Indemnitors in Section 8(c);

(b) for an accounting of profits made from the purchase and sale (or sale and purchase) by Indemnitee of securities of the Company within the meaning of Section 16(b) of the Exchange Act, or similar provisions of state statutory law or common law;

(c) in connection with any Proceeding (or any part of any Proceeding) initiated by Indemnitee, including any Proceeding (or any part of any Proceeding) initiated by Indemnitee against the Company or its directors, officers, employees, or other indemnitees, unless (i) the Board authorized the Proceeding (or any part of any Proceeding) prior to its initiation or (ii) the Company provides the indemnification, in its sole discretion, pursuant to the powers vested in the Company under applicable law;

(d) with respect to remuneration paid to Indemnitee if it is determined by final judgment or other final adjudication that such remuneration was in violation of law (and, in this respect, both the Company and Indemnitee have been advised that the SEC believes that indemnification for liabilities arising under the federal securities laws is against public policy and is, therefore, unenforceable and that claims for indemnification should be submitted to appropriate courts for adjudication, as indicated in the last paragraph of this Section 9);

(e) a final judgment or other final adjudication is made that Indemnitee's conduct was in bad faith, knowingly fraudulent or deliberately dishonest or constituted willful misconduct (but only to the extent of such specific determination);

(f) in connection with any claim for reimbursement or any recovery policy of the Company by Indemnitee of any bonus or other incentive-based or equity-based compensation or of any profits realized by Indemnitee from the sale of securities of the Company, as required in each case under the Exchange Act (including any such reimbursements that arise from an accounting restatement of the Company pursuant to Section 304 of the Sarbanes-Oxley Act or Section 954 of the Dodd-Frank Act, or the payment to the Company of profits arising from the purchase and sale by Indemnitee of securities in violation of Section 306 of the Sarbanes-Oxley Act)), if Indemnitee is held liable therefor (including pursuant to any settlement); or

(g) on account of conduct that is established by a final judgment as constituting a breach of Indemnitee's duty of loyalty to the Company or resulting in any personal profit or advantage to which Indemnitee is not legally entitled.

For purposes of this Section 9, a final judgment or other adjudication may be reached in either the underlying proceeding or action in connection with which indemnification is sought or a separate proceeding or action to establish rights and liabilities under this Agreement.

Any provision herein to the contrary notwithstanding, the Company will not be obligated pursuant to the terms of this Agreement to indemnify Indemnitee or otherwise act in violation of any undertaking appearing in and required by the rules and regulations promulgated under the Securities Act, or in any registration statement filed with the SEC under the Securities Act. Indemnitee acknowledges that paragraph (h) of Item 512 of Regulation S-K promulgated under the Securities Act currently generally requires the Company to undertake, in connection with any registration statement filed under the Securities Act, to submit the issue of the enforceability of Indemnitee's rights under this Agreement in connection with any liability under the Securities Act on public policy grounds to a court of appropriate jurisdiction and to be governed by any final adjudication of such issue. Indemnitee specifically agrees that any such undertaking will supersede the provisions of this Agreement and to be bound by any such undertaking.

10. Duration of Agreement. All agreements and obligations of the Company contained herein will continue during the period Indemnitee is an officer or director of the Company (or is or was serving at the request of the Company as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise) and will continue thereafter so long as Indemnitee will be subject to any Proceeding (or any proceeding commenced under Section 7) by reason of his or her Corporate Status, whether or not he or she is acting or serving in any such capacity at the time any liability or expense is incurred for which indemnification can be provided under this Agreement. This Agreement will be binding on and inure to the benefit of and be enforceable by the parties of this Agreement and their respective successors (including any direct or indirect successor by purchase, merger, consolidation or otherwise to all or substantially all of the business or assets of the Company), assigns, spouses, heirs, executors, and personal and legal representatives.

11. Security. To the extent requested by Indemnitee and approved by the Board, the Company may at any time and from time to time provide security to Indemnitee for the Company's obligations under this Agreement through an irrevocable bank line of credit, funded trust or other collateral. Any such security, once provided to Indemnitee, may not be revoked or released without the prior written consent of Indemnitee.

12. Enforcement.

(a) The Company expressly confirms and agrees that it has entered into this Agreement and assumes the obligations imposed on it to induce Indemnitee to serve as an officer and/or director of the Company, and the Company acknowledges that Indemnitee is relying on this Agreement in serving as an officer and/or director of the Company.

(b) Other than as provided in this Agreement, this Agreement constitutes the entire agreement between the parties with respect to this subject matter and supersedes all prior agreements and understandings, oral, written and implied, between the parties with respect to this subject matter.

13. Definitions. For purposes of this Agreement:

(a) "**Beneficial Owner**" has the meaning given to such term in Rule 13d-3 under the Exchange Act; provided, however, that Beneficial Owner will exclude any Person otherwise becoming a Beneficial Owner by reason of the Company's stockholders approving a merger of the Company with another entity.

(b) "**Board**" means the Board of Directors of the Company.

(c) "**Change in Control**" means the earliest to occur after the date of this Agreement of any of the following events:

(i) Acquisition of Stock by Third Party. Any Person is or becomes the Beneficial Owner (as defined above), directly or indirectly, of securities of the Company representing 25% or more of the combined voting power of the Company's then outstanding securities;

(ii) Change in Board. During any period of two consecutive years (not including any period prior to the execution of this Agreement), individuals who at the beginning of such period constitute the Board, and any new director (other than a director designated by a person who has entered into an agreement with the Company to effect a transaction described in clause (i), (iii) or (iv) of this definition of Change in Control) whose election by the Board or nomination for election by the Company's stockholders was approved by a vote of at least two-thirds of the directors then still in office who either were directors at the beginning of the period or whose election or nomination for election was previously so approved, cease for any reason to constitute at least a majority of the members of the Board;

(iii) Corporate Transactions. The effective date of a merger or consolidation of the Company with any other entity, other than a merger or consolidation which would result in the voting securities of the Company outstanding immediately prior to such merger or consolidation continuing to represent (either by remaining outstanding or by being converted into voting securities of the surviving entity) more than 51% of the combined voting power of the voting securities of the surviving entity outstanding immediately after such merger or consolidation and with the power to elect at least a majority of the Board or other governing body of such surviving entity;

(iv) Liquidation. The approval by the Company's stockholders of a complete liquidation of the Company or an agreement for the sale or disposition by the Company of all or substantially all of the Company's assets; and

(v) Other Events. There occurs any other event of a nature that would be required to be reported in response to Item 6(e) of Schedule 14A of Regulation 14A (or a response to any similar item on any similar schedule or form) promulgated under the Exchange Act, whether or not the Company is then subject to such reporting requirement.

(d) "**Corporate Status**" describes the status of a person who is or was a director, officer, employee, agent or fiduciary of the Company or of any other corporation, partnership, joint venture, trust, employee benefit plan or other enterprise that such person is or was serving at the express written request of the Company.

(e) "**Disinterested Director**" means a non-executive director of the Company who is not and was not a party to the Proceeding in respect of which indemnification is sought by Indemnitee.

(f) "**Dodd-Frank Act**" means the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010.

(g) "**Enterprise**" means the Company and any other corporation, partnership, joint venture, trust, employee benefit plan or other enterprise that Indemnitee is or was serving at the express written request of the Company as a director, officer, employee, agent or fiduciary.

(h) "**Exchange Act**" means the Securities Exchange Act of 1934, as amended.

(i) "**Expenses**" includes all documented and reasonable attorneys' fees, retainers, court costs, transcript costs, fees of experts, witness fees, travel expenses, duplicating costs, printing and binding costs, telephone charges, postage, delivery service fees, and all other disbursements or expenses of the types customarily incurred in connection with prosecuting, defending, preparing to prosecute or defend, investigating, participating, or being or preparing to be a witness in a Proceeding, or responding to, or objecting to, a request to provide discovery in any Proceeding. Expenses also will include Expenses incurred in connection with any appeal resulting from any Proceeding and any federal, state, local or foreign taxes imposed on Indemnitee as a result of the actual or deemed receipt of any payments under this Agreement, including without limitation the premium, security for, and other costs relating to any cost bond, supersede as bond, or other appeal bond or its equivalent. Expenses will not include amounts paid in settlement by Indemnitee or the amount of judgments or fines against Indemnitee.

(j) "**Independent Counsel**" means a law firm, or a member of a law firm, that is experienced in matters of corporation law and neither presently is, nor in the past five years has been, retained to represent (i) the Company or Indemnitee in any matter material to either such party (other than with respect to matters concerning Indemnitee under this Agreement, or of other indemnitees under similar indemnification agreements) or (ii) any other party to the Proceeding giving rise to a claim for indemnification under this Agreement. Notwithstanding the foregoing, the term "Independent Counsel" will not include any person who, under the applicable standards of professional conduct then prevailing, would have a conflict of interest in representing either the Company or Indemnitee in an action to determine Indemnitee's rights under this Agreement. The Company agrees to pay the reasonable fees of the Independent Counsel referred to above and to fully indemnify such counsel against any and all Expenses, claims, liabilities and damages arising out of or relating to this Agreement or its engagement pursuant hereto.

(k) "**Person**" for purposes of the definition of Beneficial Owner and Change in Control set forth above, will have the meaning as set forth in Sections 13(d) and 14(d) of the Exchange Act; provided, however, that Person will exclude (i) the Company, (ii) any trustee or other fiduciary holding securities under an employee benefit plan of the Company and (iii) any corporation owned, directly or indirectly, by the Company's stockholders in substantially the same proportions as their ownership of stock of the Company.

(l) "**Proceeding**" includes any threatened, pending or completed action, suit, arbitration, alternate dispute resolution mechanism, investigation, inquiry, administrative hearing or any other actual, threatened or completed proceeding, whether brought by or in the right of the Company or otherwise and whether civil, criminal, administrative or investigative, in which Indemnitee was, is or will be involved as a party or otherwise, by reason of the fact that Indemnitee is or was an officer or director of the Company, by reason of any action taken by him or her or of any inaction on his or her part while acting as an officer or director of the Company, or by reason of the fact that he or she is or was serving at the request of the Company as a director, officer, employee, agent or fiduciary of another corporation, partnership, joint venture, trust or other Enterprise; in each case whether or not he or she is acting or serving in any such capacity at the time any liability or expense is incurred for which indemnification can be provided under this Agreement; including one pending on or before the date of this Agreement, but excluding one initiated by an Indemnitee pursuant to Section 7 of this Agreement to enforce his or her rights under this Agreement.

(m) "**Sarbanes-Oxley Act**" will mean the Sarbanes-Oxley Act of 2002, as amended.

(n) "**SEC**" will mean the Securities and Exchange Commission.

(o) "**Securities Act**" will mean the Securities Act of 1933, as amended.

14. Severability. The invalidity or unenforceability of any provision hereof will in no way affect the validity or enforceability of any other provision. Without limiting the generality of the foregoing, this Agreement is intended to confer upon Indemnitee indemnification rights to the fullest extent permitted by applicable laws. In the event any provision hereof conflicts with any applicable law, such provision will be deemed modified, consistent with the aforementioned intent, to the extent necessary to resolve such conflict.

15. Modification and Waiver. No supplement, modification, termination or amendment of this Agreement will be binding unless executed in writing by both of the parties hereto. No waiver of any of the provisions of this Agreement will be deemed or will constitute a waiver of any other provisions hereof (whether or not similar) nor will such waiver constitute a continuing waiver.

16. Notice By Indemnitee. Indemnitee agrees promptly to notify the Company in writing upon being served with or otherwise receiving any summons, citation, subpoena, complaint, indictment, information or other document relating to any Proceeding or matter that may be subject to indemnification covered under this Agreement. The failure to so notify the Company will not relieve the Company of any obligation which it may have to Indemnitee under this Agreement or otherwise unless and only to the extent that such failure or delay materially prejudices the Company.

17. Notices. All notices and other communications given or made pursuant to this Agreement will be in writing and will be deemed effectively given: (a) upon personal delivery to the party to be notified; (b) when sent by confirmed electronic mail or facsimile if sent during normal business hours of the recipient, and if not so confirmed, then on the next business day; (c) five days after having been sent by registered or certified mail, return receipt requested, postage prepaid; or (d) one day after deposit with a nationally recognized overnight courier, specifying next day delivery, with written verification of receipt. All communications will be sent:

(a) To Indemnitee at the address on the books and records of the Company.

(b) To the Company at:

Personalis, Inc.
1330 O'Brien Drive
Menlo Park, California 94025
Attention: Chief Executive Officer

or to such other address as may have been furnished to Indemnitee by the Company or to the Company by Indemnitee, as the case may be.

18. Counterparts. This Agreement may be executed in two or more counterparts, each of which will be deemed an original, but all of which together will constitute one and the same Agreement. This Agreement may also be executed and delivered by facsimile signature, electronic mail (including pdf or any electronic signature complying with the U.S. federal ESIGN Act of 2000, Uniform Electronic Transactions Act or other applicable law) or other transmission method and in two or more counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument and be deemed to have been duly and validly delivered and be valid and effective for all purposes.

19. Headings. The headings of the paragraphs of this Agreement are inserted for convenience only and will not be deemed to constitute part of this Agreement or to affect the construction thereof.

20. Governing Law and Consent to Jurisdiction. This Agreement and the legal relations among the parties will be governed by, and construed and enforced in accordance with, the laws of the State of Delaware, without regard to its conflict of laws rules. The Company and Indemnitee hereby irrevocably and unconditionally (i) agree that any action or proceeding arising out of or in connection with this Agreement will be brought only in the Court of Chancery of the State of Delaware (the "**Delaware Court**"), and not in any other state or federal court in the United States of America or any court in any other country, (ii) consent to submit to the exclusive jurisdiction of the Delaware Court for purposes of any action or proceeding arising out of or in connection with this Agreement, (iii) appoint, to the extent such party is not otherwise subject to service of process in the State of Delaware, irrevocably The Corporation Trust Company as its agent in the State of Delaware for acceptance of legal process in connection with any such action or proceeding against such party with the same legal force and validity as if served upon such party personally within the State of Delaware, (iv) waive any objection to the laying of venue of any such action or proceeding in the Delaware Court, and (v) waive, and agree not to plead or to make, any claim that any such action or proceeding brought in the Delaware Court has been brought in an improper or inconvenient forum.

[SIGNATURE PAGE TO FOLLOW]

The parties have executed this Agreement on and as of the day and year first above written.

PERSONALIS, INC.

By: _____
Name:
Title:

INDEMNITEE

_____
Name:

June 2, 2019

John West

Re: Employment Terms

Dear John,

This Employment Terms letter agreement, including the exhibits hereto (the "Agreement"), confirms the terms and conditions of your continuing employment with Personalis, Inc. ("Personalis" or the "Company").

Position Description

Your position with Personalis is Chief Executive Officer, reporting to the Company's Board of Directors (the "Board"). You will work at the Company's corporate headquarters, and your duties will require business travel.

You will be expected to perform the customary duties of your position, duties specified in the Bylaws of the Company, and as may be required by the Board.

Your employment relationship with the Company will also be governed by the general employment policies and practices of the Company, except that if the terms of this Agreement conflict with such policies and practices, this Agreement will control. Personalis may change your duties and work location from time to time in its discretion.

Exclusive Employment

During your employment with the Company, you will devote your full business time, skill, and attention to your duties and responsibilities, and will perform them faithfully, diligently and competently, and you will use your best efforts to further the business of the Company. You will be expected to be available and working during the Company's regular business hours, and such additional time as appropriate to manage your responsibilities.

While you render services to the Company, you agree that you will not engage in any other employment, consulting, or other business activity for which you receive remuneration, other than service on any board of directors which has been previously disclosed to the Company, without the prior written consent of the Company. During your employment with the Company, you agree that you will not assist any person or entity in competing with the Company, in preparing to compete with the Company or in hiring any employees or consultants of the Company.

Salary

Your current salary is $500,000 annually, less applicable payroll tax withholding and deductions, and is subject to adjustment based on the Company's compensation policies, as in effect from time to time.

Annual Bonus

You are eligible to participate in the Company's annual bonus plan, as adopted by the Board for each bonus year, with a bonus of up to 70% of your base salary, and a target amount of the bonus for target levels of performance equal to 40% of your annual salary, less applicable payroll tax withholding and deductions.

Long Term Bonus

You are eligible to earn a lump sum cash bonus (the "Long Term Bonus") upon the earlier to occur of (a) the effective date of a "Change in Control" and (b) the last day of the applicable period (set forth below) in which the Company achieves a valuation of $1 billion (such valuation achievement, the "Valuation Trigger"), subject in all cases to your continued employment through such earlier date. The Long Term Bonus will be equal to the product of (x) 1% and (y) the difference between (i) (A) in the case of a Change in Control, the net present value for financial accounting purposes, calculated at the closing of the Change in Control, of the "Total Consideration" or (B) in the case of a Valuation Trigger, the "Valuation" of the Company and (ii) the aggregate number of dollars invested in connection with the sale of the Company's equity securities in all future financings from the date of the Company's inception through the date of a Change in Control or Valuation Trigger. While the Company remains private, the "Valuation" will be calculated as ten (10) times the GAAP revenue achieved over the trailing twelve (12)-calendar-month period (the applicable period). After the Company has completed an initial public offering of a class of the capital stock of the Company, the "Valuation" will be calculated as (x) the average closing price per share over the trailing thirty (30) calendar days (the applicable period) multiplied by (y) the number of outstanding shares of the applicable class of publicly traded stock, as calculated on a fully diluted basis (that is, as if all outstanding warrants and granted compensatory awards had been issued). The Company and you believe that, as of the date of this Agreement, each of both possible Valuation Triggers and the closing of a Change in Control reflect a "*substantial risk of forfeiture*" for purposes of Treasury Regulations Section 1.409A-1(b)(4). In order to ensure timely payment of any earned Long Term Bonus, the Board will determine on at least a quarterly basis, and not later than the first day of the third month of each calendar quarter during your employment, whether the Long Term Bonus has become vested.

The Long Term Bonus will be paid in a lump sum, subject to payroll withholding and deduction, within sixty (60) days following the applicable triggering event, and in all cases not later than the fifteenth (15th) day of the third month following the end of the calendar year in which the Long Term Bonus vests (that is, the calendar year in which the triggering event occurs) so that this Long Term Bonus is paid in accordance with Treasury Regulation Section 1.409A-1(b)(4). If the Valuation Trigger is the vesting event, the Long Term Bonus will be paid in shares of the Company's common stock having a fair market value equal to the earned Long Term Bonus, less that number of whole shares withheld by the Company to cover the applicable minimum tax withholding obligation. If a Change in Control is the vesting event, the Long Term Bonus will be paid to you in the same mix of cash, securities and any other property as received by other stockholders in the Change in Control.

For purposes of this Agreement, “Change in Control” means the consummation of a transaction or series of transactions that results in any of the following: (a) a merger, consolidation or similar corporate transaction involving (directly or indirectly) the Company and, immediately following which the stockholders of the Company immediately prior thereto do not own, directly or indirectly, outstanding voting securities representing more than fifty percent (50%) of the combined outstanding voting power of the surviving entity in such merger, consolidation or similar corporate transaction or more than fifty percent (50%) of the combined outstanding voting power of the parent of the surviving entity in such merger, consolidation or similar corporate transaction; or (b) a sale or other disposition of all or substantially all of the consolidated assets of the Company that occurs over a period of not more than twelve (12) months. However, a Change in Control will not include (x) any consolidation or merger effected exclusively to change the domicile of the Company, or (y) any transaction or series of transactions principally for bona fide equity financing purposes in which cash is received by the Company or any successor or indebtedness of the Company is cancelled or converted or a combination thereof. In addition, no transaction will be a Change in Control unless it is also “change in ownership of a corporation” or “change in ownership of a substantial portion of a corporation’s assets” as defined under in Treasury Regulations Sections 1.409A-3(i)(5)(v) and (vii) without regard to any alternative definitions thereunder.

For purposes of the Long Term Bonus, “Total Consideration” means, as determined by the Board in its sole discretion, the sum of any cash and the fair market value of any securities and other property which can reasonably be expected to be paid to the Company and/or its equity security holders upon or within twenty-four (24) months of such Change in Control (which shall include escrow payments, milestone payments, delayed purchase payments and earn-outs), after the payment of transaction fees and expenses (including, without limitation, payments to investment bankers and attorneys) and net of any cash received pursuant to the payment of any stock option or warrant exercise price in connection with the Change in Control, that would be, but for the existence of the Long Term Bonus, legally available for payment or distribution at or after the closing of the Change in Control to the Company and/or its equity securityholders in respect of the assets and/or the equity securities of the Company, including any cash, securities or property, the receipt of which is contingent upon the passage of time or the occurrence or non-occurrence of some future events, circumstances and/or conditions (such as amounts of consideration subject to an escrow, a purchase price adjustment, an earn-out or indemnity claims) (“Contingent Consideration”). The Board will determine in good faith the value of the Total Consideration, including any portion of the Total Consideration that is Contingent Consideration, as of the closing of the Change in Control (taking into account appropriate discounts for time value of money, risk of forfeiture, non-achievement of future payment milestones and other contingencies).

Benefit Programs

As a Company employee, you will continue to be eligible to participate in the applicable employee benefit programs in accordance with their terms, as may be offered by Personalis from time to time in its discretion. The foregoing notwithstanding, the Company agrees to provide you with, at a minimum, long-term and short-term disability coverage in an amount of at least $179,375 in annual benefits. You are eligible to accrue and use Paid Time Off (“PTO”) or vacation/sick time in accordance with the terms of the Company’s standard PTO policy and practices, as such policies and practices are established and updated from time to time, but in no event at a rate that is less than twenty (20) days per year.

"At-Will" Employment

Your employment with the Company will continue to be "at will," meaning that either you or the Company may terminate your employment at any time, for any lawful reason or no reason, and with or without cause or advance notice. The "at will" nature of your employment relationship may only be modified in an express written agreement signed by you and the Company.

Severance

You are eligible to receive severance benefits in accordance with the Executive Severance Agreement attached hereto and incorporated as Exhibit A.

Change in Control Vesting

If a Change in Control occurs during your employment with the Company, the Company will accelerate the vesting of each of your then outstanding equity compensation awards as to the number of then-unvested shares subject to each such award that would have become vested, in the ordinary course, within the first twelve (12) months following the Change in Control, effective as of immediately prior to the closing of the transaction (the "Change in Control Accelerated Vesting").

Confidential Information

You agree to sign and comply with the Company's standard Employee Confidential Information and Invention Assignment Agreement.

Arbitration

You and the Company both agree that any and all disputes, claims, or causes of action, in law or equity, including but not limited to statutory claims, arising from or relating to the enforcement, breach, performance, or interpretation of this Agreement, your employment with the Company, or the termination of your employment with the Company, will be resolved pursuant to the Federal Arbitration Act, 9 U.S.C. §1-16, and to the fullest extent permitted by law, by final, binding and confidential arbitration conducted in San Jose, California by JAMS, Inc. ("JAMS") or its successors. Both you and the Company acknowledge that by agreeing to this arbitration procedure, ***you and the Company each waive the right to resolve any such dispute through a trial by jury or judge or administrative proceeding***. Any such arbitration proceeding will be governed by JAMS's then applicable rules and procedures for employment disputes, which can be found at http://www.jamsadr.com/rules-employment-arbitration/, and which will be provided to you upon request. In any such proceeding, the arbitrator shall: (a) have the authority to compel adequate discovery for the resolution of the dispute and to award such relief as would otherwise be permitted by law; and (b) issue a written arbitration decision including the arbitrator's essential findings and conclusions and a statement of the award. You and the Company each shall be entitled to all rights and remedies that either would be entitled to pursue in a court of law. Nothing in this Agreement is intended to prevent either the Company or you from obtaining injunctive relief in court to prevent irreparable harm pending the conclusion of any such arbitration pursuant to applicable law. The Company shall pay all filing fees in excess of those which would be required if the dispute were decided in a court of law, and shall pay the arbitrator's fees and any other fees or costs unique to arbitration.

Entire Agreement; Modification

This Agreement, together with its exhibits, forms the complete and exclusive statement of the terms of your continuing employment with the Company, and supersedes any and all other agreements or promises made to you by anyone, whether oral, written or implied, including without limitation that certain Executive Employment Agreement dated August 4, 2011 between you and the Company (the "Prior Agreement"). You agree and acknowledge, in consideration of your continuing employment and the compensation and benefits provided to you by the Company, that your continuing employment pursuant to the terms of this Agreement does not constitute and shall not be deemed for any purpose to be a termination of employment giving rise to severance or other payments under the Prior Agreement or otherwise.

Changes in your employment terms, other than those changes expressly reserved to the Company's discretion in this Agreement, require a written modification signed by Personalis.

Sincerely,

Jonathan MacQuitty
Chair of the Board of Directors

Accepted and agreed this 2nd day of June, 2019

/s/ John West
John West

1330 O'Brien Drive, Menlo Park, CA 94025 **O:** +1.650.752.1300 **F:** +1.650.752.1301 http://www.personalis.com

EXHIBIT A

EXECUTIVE SEVERANCE AGREEMENT

This Executive Severance Agreement (the "Agreement") is entered into as of June 2, 2019, by and between John West ("Executive") and Personalis, Inc. (the "Company"). This Agreement is intended to provide Executive with certain benefits described herein upon the occurrence of specific events.

RECITALS

A. The Company's Board of Directors (the "Board") believes it is in the best interests of the Company and its shareholders to retain Executive and provide incentives to Executive to continue in the service of the Company.

B. The Board further believes that it is imperative to provide Executive with certain benefits upon termination of Executive's employment, which benefits are intended to provide Executive with financial security and sufficient income and encouragement to Executive to remain with the Company.

C. To accomplish the foregoing objectives, the Board has directed the Company, upon execution of this Agreement by Executive, to agree to the terms provided in this Agreement.

Now, therefore, in consideration of the mutual promises, covenants and agreements contained herein, the parties hereto agree as follows:

1. At-Will Employment; Severance Benefits. Executive's employment is at-will, which means that the Company may terminate Executive's employment at any time, with or without Cause or advance notice. Similarly, Executive may resign Executive's employment at any time, with or without advance notice, and with or without Good Reason. Executive shall not receive any compensation of any kind, including, without limitation, equity award vesting acceleration and severance benefits, following Executive's last day of employment with the Company, except as expressly provided herein.

(a) Involuntary Termination. If Executive's employment with the Company is terminated by the Company without Cause (and other than as a result of death or disability), or Executive resigns for Good Reason, then provided such termination constitutes a "separation from service" (as defined under Treasury Regulation Section 1.409A-1(h), without regard to any alternative definition thereunder, a "Separation from Service"), and provided that Executive remains in compliance with the terms of this Agreement, the Company shall provide Executive with the following "Severance Benefits":

(i) The Company shall pay a lump sum cash payment equal to twelve (12) months of Executive's base salary in effect as of the date of Executive's employment termination (ignoring any reduction that results in Good Reason), subject to standard payroll deductions and withholdings (the "Severance"). The Severance will be paid in a lump sum on the sixtieth (60^{th}) day following Executive's Separation from Service, provided the Separation Agreement (as discussed below) has become effective.

(ii) Provided that Executive timely elects continued coverage under COBRA, the Company shall pay Executive's COBRA premiums to continue Executive's coverage (including coverage for eligible dependents, if applicable) ("COBRA Premiums") through the period (the "COBRA Premium Period") starting on the Executive's Separation from Service and ending on the earliest to occur of: (i) twelve (12) months following Executive's Separation from Service; (ii) the date Executive becomes eligible for group health insurance coverage through a new employer; or (iii) the date Executive ceases to be eligible for COBRA continuation coverage for any reason. If Executive becomes covered under another employer's group health plan or otherwise ceases to be eligible for COBRA during the COBRA Premium Period, Executive must immediately notify the Company of such event. Notwithstanding the foregoing, if the Company determines, in its sole discretion, that it cannot pay the COBRA Premiums without a substantial risk of violating applicable law (including, without limitation, Section 2716 of the Public Health Service Act), the Company instead shall pay to Executive, on the first day of each calendar month, a fully taxable cash payment equal to the applicable COBRA premiums for that month (including premiums for Executive and Executive's eligible dependents who have elected and remain enrolled in such COBRA coverage), subject to applicable tax withholdings (such amount, the "Special Cash Payment"), for the remainder of the COBRA Premium Period. Executive may, but is not obligated to, use such Special Cash Payments toward the cost of COBRA premiums. If the Company pays the Special Cash Payments, no payment will be made prior the sixtieth (60th) day following the Separation from Service; on the sixtieth (60th) day following Executive's Separation from Service, the Company will make the first payment to Executive under this paragraph, in a lump sum, equal to the aggregate Special Cash Payments that the Company would have paid to Executive through such date had the Special Cash Payments commenced on the date otherwise determined under this paragraph, with the balance of the Special Cash Payments paid thereafter on the schedule described above.

(iii) In addition to the Change in Control Accelerated Vesting (if applicable), as defined in that certain Employment Terms letter agreement between Executive and the Company of even date herewith, the Company will accelerate the vesting of each of Executive's then outstanding equity compensation awards as to the number of then-unvested shares subject to each such award that would have become vested, in the ordinary course, within the first twenty-four (24) months following his Separation from Service, effective as of the date of the Separation from Service.

(b) Conditions to Severance Benefits. The receipt of any Severance Benefits under this Agreement will be subject to Executive signing and not revoking a separation agreement and release of claims in a form reasonably satisfactory to the Company (the "Separation Agreement") that is effective not later than the sixtieth (60th) day following Executive's Separation from Service. No Severance Benefits will be paid unless the Separation Agreement becomes effective. As an additional condition to the receipt of the Severance Benefits, Executive must also resign from all director, officer and other positions Executive then holds with the Company and any of its affiliates.

(c) Definitions.

(i) Cause. For purposes of this Agreement, "Cause" shall mean the occurrence of one or more of the following: (A) Executive's gross negligence or knowing and willful action which is or is likely to be materially injurious to the Company; (B) any intentional act by Executive in connection with his responsibilities as an employee constituting fraud or a felony crime; (C) Executive's consistent failure to report for work or perform his duties as directed by the Company's Board of Directors; (D) persistent or repeated material breach of this Agreement or any agreement between Executive and the Company; (E) Executive's becoming disqualified from holding office through his own act or omission; (F) an unauthorized use or disclosure by the Executive of the Company's confidential information or trade secrets, which use or disclosure causes material harm to the Company; or (G) a material failure by the Executive to comply with the Company's written policies or rules which is or is likely to be materially injurious to the Company; *provided, however,* that in any such event, there has been delivered to Executive a written demand for performance from the Board which describes the basis for the Board's belief that Executive has committed one of the acts set forth in clauses (A)-(G) above and provides Executive with thirty (30) days to take corrective action (which may include any suspension period).

(ii) Good Reason. For purposes of this Agreement, Executive shall have "Good Reason" for resignation from employment with the Company if any of the following actions are taken by the Company without Executive's prior written consent: (A) a material reduction in Executive's base salary, which the parties agree is a reduction of at least ten percent (10%) of Executive's base salary (provided, however, that such reduction will not be considered "Good Reason" if made in connection with an across-the-board salary reduction affecting all members of management); (B) a material reduction in Executive's duties, responsibilities and/or authority, or a requirement that Executive report to a corporate officer rather than directly to the Board; (C) a relocation of Executive's principal place of employment to a place that increases Executive's one-way commute by more than fifty (50) miles as compared to Executive's then-current principal place of employment immediately prior to such relocation; or (D) a material breach by the Company of this Agreement. In order to resign for Good Reason, Executive must provide written notice to the Board within thirty (30) days after the first occurrence of the event giving rise to Good Reason setting forth the basis for Executive's resignation, allow the Company at least thirty (30) days from receipt of such written notice to cure such event, and if such event is not reasonably cured within such period, Executive must resign from all positions Executive then holds with the Company effective not later than thirty (30) days after the expiration of the cure period. Executive understands and agrees that the requirement for Executive's performance of services within twenty (20) miles of Palo Alto, California does not give rise to Good Reason.

2. Section 409A. It is intended that all of the benefits and other payments payable under this Agreement satisfy, to the greatest extent possible, the exemptions from the application of Code Section 409A provided under Treasury Regulations 1.409A-1(b)(4), 1.409A-1(b)(5), 1.409A-1(b)(6) and 1.409A-1(b)(9), and this Agreement will be construed to the greatest extent possible as consistent with those provisions, and to the extent not so exempt, this Agreement (and any definitions hereunder) will be construed in a manner that complies with Code Section 409A. For purposes of Code Section 409A (including, without limitation, for

purposes of Treasury Regulation Section 1.409A-2(b)(2)(iii)), Executive's right to receive any installment payments under this Agreement (whether severance payments, reimbursements or otherwise) shall be treated as a right to receive a series of separate payments and, accordingly, each installment payment hereunder shall at all times be considered a separate and distinct payment. If the Company determines that Executive is a "specified employee" under Code Section 409A(a)(2)(B)(i) at the time of Executive's Separation from Service, then (a) the Severance and Special Cash Payment, to the extent that they are subject to Code Section 409A, will commence or be paid (as applicable) on the first business day following (i) expiration of the six (6)-month period measured from Executive's Separation from Service or (ii) the date of Executive's death and (b) the installments (if any) that otherwise would have been paid prior to such date will be paid in a lump sum when the payments commence.

3. Miscellaneous Provisions.

(a) No Duty to Mitigate. Executive shall not be required to mitigate the amount of any payment contemplated by this Agreement (whether by seeking new employment or in any other manner), nor shall any such payment be reduced by any earnings that Executive may receive from any other source.

(b) Waiver. No provision of this Agreement shall be modified, waived or discharged unless the modification, waiver or discharge is agreed to in writing and signed by Executive and by an authorized officer of the Company (other than Executive). No waiver by either party of any breach of, or of compliance with, any condition or provision of this Agreement by the other party shall be considered a waiver of any other condition or provision or of the same condition or provision at another time.

(c) Whole Agreement. No agreements, representations or understandings (whether oral or written and whether express or implied) which are not expressly set forth in this Agreement have been made or entered into by either party with respect to the subject matter hereof. This Agreement supersedes any agreement (or portion thereof) concerning similar subject matter dated prior to the date of this Agreement, and by execution of this Agreement both parties agree that any such predecessor agreement (or portion thereof) shall be deemed null and void.

(d) Choice of Law. The validity, interpretation, construction and performance of this Agreement shall be governed by the laws of the State of California without reference to conflict of laws provisions, and the parties hereto submit to the exclusive jurisdiction of the state and federal courts of the State of California.

(e) Severability. If any term or provision of this Agreement or the application thereof to any circumstance shall, in any jurisdiction and to any extent, be invalid or unenforceable, such term or provision shall be ineffective as to such jurisdiction to the extent of such invalidity or unenforceability without invalidating or rendering unenforceable the remaining terms and provisions of this Agreement or the application of such terms and provisions to circumstances other than those as to which it is held invalid or unenforceable, and a suitable and equitable term or provision shall be substituted therefor to carry out, insofar as may be valid and enforceable, the intent and purpose of the invalid or unenforceable term or provision.

(f) Legal Fees and Expenses. The parties shall each bear their own expenses, legal fees and other fees incurred in connection with the execution of this Agreement.

(g) No Assignment of Benefits. The rights of any person to payments or benefits under this Agreement shall not be made subject to option or assignment, either by voluntary or involuntary assignment or by operation of law, including (without limitation) bankruptcy, garnishment, attachment or other creditor's process, and any action in violation of this Section 3(g) shall be void.

(h) Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together will constitute one and the same instrument.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date written below.

/s/ John West

John West

Date: June 2, 2019

PERSONALIS, INC.

By: /s/ Jonathan MacQuitty
Jonathan MacQuitty
Chair of the Board of Directors

Date: June 2, 2019

June 2, 2019

Clinton Musil

Re: Employment Terms

Dear Clinton,

This Employment Terms letter agreement, including the exhibit hereto (the "Agreement"), confirms the terms and conditions of your continuing employment with Personalis, Inc. ("Personalis" or the "Company").

Position Description

Your position with Personalis is Chief Business Officer, reporting directly to the Company's Chief Executive Officer. You will work at the Company's corporate headquarters, and your duties will require business travel.

You will be expected to perform the customary duties of your position, duties specified in the Bylaws of the Company, and as may be required by the Company's Board of Directors (the "Board").

Your employment relationship with the Company will also be governed by the general employment policies and practices of the Company, except that if the terms of this Agreement conflict with such policies and practices, this Agreement will control. Personalis may change your position, duties, and work location from time to time in its discretion.

Exclusive Employment

During your employment with the Company, you will devote your full business time, skill, and attention to your duties and responsibilities, and will perform them faithfully, diligently and competently, and you will use your best efforts to further the business of the Company. You will be expected to be available and working during the Company's regular business hours, and such additional time as appropriate to manage your responsibilities.

While you render services to the Company, you agree that you will not engage in any other employment, consulting, or other business activity for which you receive remuneration, other than service on any board of directors which has been previously disclosed to the Company, without the prior written consent of the Company. During your employment with the Company, you agree that you will not assist any person or entity in competing with the Company, in preparing to compete with the Company or in hiring any employees or consultants of the Company.

Salary

Your current salary is $325,000 annually, less applicable payroll tax withholding and deductions, and is subject to adjustment based on the Company's compensation policies, as in effect from time to time.

Bonus

You are eligible to participate in the Company's annual bonus plan, as adopted by the Board for each bonus year, with a bonus target of 30% of your annual salary, less applicable payroll tax withholding and deductions.

Benefit Programs

As a Company employee, you will continue to be eligible to participate in the applicable employee benefit programs in accordance with their terms, as may be offered by Personalis from time to time in its discretion.

"At-Will" Employment

Your employment with the Company will continue to be "at will," meaning that either you or the Company may terminate your employment at any time, for any lawful reason or no reason, and with or without cause or advance notice. Although your duties, title, compensation, and benefits may change, the "at will" nature of your employment relationship may only be modified in an express written agreement signed by you and the Company.

Severance

You are eligible to receive severance benefits in accordance with the Executive Severance Agreement attached hereto and incorporated as Exhibit A.

Confidential Information

You agree to sign and comply with the Company's standard Employee Confidential Information and Invention Assignment Agreement.

Arbitration

You and the Company both agree that any and all disputes, claims, or causes of action, in law or equity, including but not limited to statutory claims, arising from or relating to the enforcement, breach, performance, or interpretation of this Agreement, your employment with the Company, or the termination of your employment with the Company, will be resolved pursuant to the Federal Arbitration Act, 9 U.S.C. §1-16, and to the fullest extent permitted by law, by final, binding and confidential arbitration conducted in San Jose, California by JAMS, Inc. ("JAMS") or its successors. Both you and the Company acknowledge that by agreeing to this arbitration procedure, ***you and the Company each waive the right to resolve any such dispute through a trial by jury or judge or administrative proceeding***. Any such arbitration proceeding will be governed by JAMS's then applicable rules and procedures for employment disputes, which can be found at http://www.jamsadr.com/rules-employment-arbitration/, and which will be provided to you upon request. In any such proceeding, the arbitrator shall: (a) have the authority to compel adequate discovery for the resolution of the dispute and to award such relief as would otherwise be permitted by law; and (b) issue a written arbitration decision including the arbitrator's essential findings and conclusions and a statement of the award. You and the

Company each shall be entitled to all rights and remedies that either would be entitled to pursue in a court of law. Nothing in this Agreement is intended to prevent either the Company or you from obtaining injunctive relief in court to prevent irreparable harm pending the conclusion of any such arbitration pursuant to applicable law. The Company shall pay all filing fees in excess of those which would be required if the dispute were decided in a court of law, and shall pay the arbitrator's fees and any other fees or costs unique to arbitration.

Entire Agreement; Modification

This Agreement, together with its exhibit, forms the complete and exclusive statement of the terms of your continuing employment with the Company, and supersedes any and all other agreements or promises made to you by anyone, whether oral, written or implied, including without limitation that certain Employment Offer letter agreement dated December 14, 2018 between you and the Company, and that certain Executive Severance Agreement dated December 17, 2018 between you and the Company (together, the "Prior Agreements"). You agree and acknowledge, in consideration of your continuing employment and the compensation and benefits provided to you by the Company, that your continuing employment pursuant to the terms of this Agreement does not constitute and shall not be deemed for any purpose to be a termination of employment giving rise to severance, accelerated vesting, or other benefits under the Prior Agreements or otherwise.

Changes in your employment terms, other than those changes expressly reserved to the Company's discretion in this Agreement, require a written modification signed by Personalis.

Sincerely,

Carol Tillis
Vice President, Finance and Administration

Accepted and agreed this 2nd day of June, 2019

/s/ Clinton Musil
Clinton Musil

EXHIBIT A

EXECUTIVE SEVERANCE AGREEMENT

This Executive Severance Agreement (the "***Agreement***") is entered into as of June 2, 2019, by and between Clinton Musil ("***Executive"***) and Personalis, Inc. (the "***Company***"). This Agreement is intended to provide Executive with certain benefits described herein upon the occurrence of specific events.

RECITALS

A. The Company's Board of Directors (the "***Board***") believes it is in the best interests of the Company and its shareholders to retain Executive and provide incentives to Executive to continue in the service of the Company.

B. The Board further believes that it is imperative to provide Executive with certain benefits upon termination of Executive's employment, which benefits are intended to provide Executive with financial security and sufficient income and encouragement to Executive to remain with the Company.

C. To accomplish the foregoing objectives, the Board has directed the Company, upon execution of this Agreement by Executive, to agree to the terms provided in this Agreement.

Now, therefore, in consideration of the mutual promises, covenants and agreements contained herein, the parties hereto agree as follows:

1. At-Will Employment. Executive's employment is at-will, which means that the Company may terminate Executive's employment at any time, with or without Cause or advance notice. Similarly, Executive may resign Executive's employment at any time, with or without advance notice, and with or without Good Reason. Executive shall not receive any compensation of any kind, including, without limitation, equity award vesting acceleration and severance benefits, following Executive's last day of employment with the Company, except as expressly provided herein.

2. Termination in Connection with or Following a Change in Control. If Executive's employment is terminated without Cause (as defined below) (and other than as a result of Executive's death or disability), or Executive resigns for Good Reason (as defined below), in either case within twelve (12) months after the effective date of a Change in Control, and provided such termination constitutes a "separation from service" (within the meaning of Treasury Regulation Section 1.409A-1(h), a "***Separation from Service***"), and provided further that Executive signs and allows to become effective a full

and effective release of claims in favor of the Company in a form provided by the Company (the "***Release***"), within sixty (60) days after Executive's Separation from Service (the date that the Release becomes effective and may no longer be revoked by Executive is referred to as the ***"Release Date"***), then the Company shall provide Executive with the following severance benefits (the "***Change in Control Separation Benefits***"):

(i) The Company shall pay Executive an amount equal to nine (9) months of Executive's then-current base salary, ignoring any decrease in base salary that forms the basis for Good Reason, less all applicable withholdings and deductions, paid in a lump sum within five (5) days after the Release Date (unless the release consideration period begins in one calendar year and ends in a second calendar year, in which case the severance payment shall be paid in the second calendar year).

(ii) Should Executive elect to continue Executive's medical, dental and/or vision insurance benefits pursuant to the Consolidated Omnibus Budget Reconciliation Act of 1985 ("***COBRA***") or any analogous provisions of applicable state law, the Company shall pay Executive's COBRA premiums for Executive and Executive's eligible dependents ("***COBRA Premiums***") for a period of nine (9) months following Executive's termination (the "***Change in Control Benefits Payment Period***"). Notwithstanding the foregoing, if the Company determines, in its sole discretion, that the Company cannot provide the COBRA Premiums without potentially incurring financial costs or penalties under applicable law, the Company shall in lieu thereof pay Executive a taxable cash amount, which payment shall be made regardless of whether Executive elects health care continuation coverage (the "***Health Care Benefit Payment***"). The Health Care Benefit Payment shall be paid in monthly installments on the same schedule that the COBRA Premiums would otherwise have been paid to the insurer. The Health Care Benefit Payment shall be equal to the amount that the Company would have otherwise paid for COBRA premiums (which amount shall be calculated based on the premium for the first month of coverage), and shall be paid until the expiration of the Change in Control Benefits Payment Period.

(iii) The Company shall accelerate the vesting of each of Executive's then-outstanding equity compensation awards such that the awards shall be deemed fully vested as of Executive's Separation from Service.

3. Limitations And Conditions On Covered Separation Benefits

(a) Release Prior to Payment of Benefits. Prior to the payment or provision of any of the Change in Control Separation Benefits, Executive shall execute, and allow to become effective, the Release not later than sixty (60) days following Executive's Separation from Service. Such Release shall specifically relate to all of Executive's rights and claims in existence at the time of such execution and shall confirm Executive's continuing obligations to the Company (including but not limited to obligations under any confidentiality and/or non-solicitation agreement with the Company). No Change in Control Separation Benefits will be paid prior to the Release Date. If the Company (or, if applicable, the successor entity thereto) determines that any of the

Change in Control Separation Benefits constitute "deferred compensation" under Section 409A (defined below), then, solely to the extent necessary to avoid the incurrence of the adverse personal tax consequences under Section 409A, no Change in Control Separation Benefits will be paid prior to the sixtieth (60th) day following Executive's Separation from Service. On the sixtieth (60th) day following the date of Separation from Service, the Company will pay to Executive in a lump sum the applicable Change in Control Separation Benefits that Employee would otherwise have received on or prior to such date, with the balance of the Change in Control Separation Benefits being paid as originally scheduled.

(b) Income and Employment Taxes. Executives agrees that Executive shall be responsible for any applicable taxes of any nature (including any penalties or interest that may apply to such taxes) that the Company reasonably determines apply to any payment made hereunder, that Executive's receipt of any benefit hereunder is conditioned on Executive's satisfaction of any applicable withholding or similar obligations that apply to such benefit, and that any cash payment owed hereunder will be reduced to satisfy any such withholding or similar obligations that may apply.

(c) Compliance with Section 409A. It is intended that each installment of the payments and benefits provided for in this Agreement is a separate "payment" for purposes of Treasury Regulation Section 1.409A-2(b)(2)(i). For the avoidance of doubt, it is intended that payments of the amounts set forth in this Agreement satisfy, to the greatest extent possible, the exemptions from the application of Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***") (Section 409A of the Code, together, with any state law of similar effect, "***Section 409A***") provided under Treasury Regulations 1.409A-1(b)(4), 1.409A-1(b)(5) and 1.409A-1(b)(9). However, if the Company (or, if applicable, the successor entity thereto) determines that the severance payments and benefits provided under this Agreement (the "***Agreement Payments***") constitute "deferred compensation" under Section 409A and Executive is, on the date of his or her Separation from Service, a "specified employee" of the Company or any successor entity thereto, as such term is defined in Section 409A(a)(2)(B)(i) of the Code (a "***Specified Employee***"), then, solely to the extent necessary to avoid the incurrence of the adverse personal tax consequences under Section 409A, the timing of the Covered Separation Benefit described in Section 2(a)(i) or 2(b)(i), as applicable, shall be delayed as follows: on the earlier to occur of (i) the date that is six months and one day after Executive's Separation from Service or (ii) the date of Executive's death (such earlier date, the "***Delayed Initial Payment Date***"), the Company (or the successor entity thereto, as applicable) shall pay to Executive a lump sum amount equal to the applicable benefit that Executive would otherwise have received through the Delayed Initial Payment Date if the commencement of the payment of the benefit had not been so delayed pursuant to this Section 3(c).

(d) Related Matters. Executive further acknowledges and agrees that as a condition to receipt of any severance benefits (i) Executive must comply with Executive's obligations under Executive's Employee Confidential Information and Invention Assignment Agreement; and (ii) resign from all Company and or affiliate positions, including membership on any Board (unless otherwise requested by the Company).

(e) Successors. Any successor to the Company (whether direct or indirect and whether by purchase, lease, merger, consolidation, liquidation or otherwise) to all or substantially all of the Company's business and/or assets shall assume the obligations under this Agreement and agree expressly to perform the obligations under this Agreement in the same manner and to the same extent as the Company would be required to perform such obligations in the absence of a succession. The terms of this Agreement and all of Executive's rights hereunder and thereunder shall inure to the benefit of, and be enforceable by, Executive's personal or legal representatives, executors, administrators, successors, heirs, distributees, devisees and legatees.

(f) Notice. Notices and all other communications contemplated by this Agreement shall be in writing and shall be deemed to have been duly given when personally delivered or when mailed by U.S. registered or certified mail, return receipt requested and postage prepaid. Mailed notices to Executive shall be addressed to Executive at the home address which Executive most recently communicated to the Company in writing. In the case of the Company, mailed notices shall be addressed to its corporate headquarters, and all notices shall be directed to the attention of its Chief Executive Officer.

4. Definitions.

(a) Cause. For purposes of this Agreement, ***"Cause***", as determined by the Board acting in good faith and based on information then known to it, shall mean the occurrence of one or more of the following: (i) Executive's gross negligence or knowing and willful action which is or is likely to be materially injurious to the Company; (ii) any intentional act by Executive in connection with his responsibilities as an employee constituting fraud or a felony crime; (iii) Executive's consistent failure to report for work or perform his duties as directed by the Company's Board of Directors; (iv) persistent or repeated material breach of this Agreement or any agreement between Executive and the Company; (v) Executive becoming disqualified from holding office through his own act or omission; (vi) an unauthorized use or disclosure by the Executive of the Company's confidential information or trade secrets, which use or disclosure causes material harm to the Company; or (vii) a material failure by the Executive to comply with the Company's written policies or rules which is or is likely to be materially injurious to the Company.

(b) Change in Control. For purposes of this Agreement, ***"Change in Control"*** means the consummation of a transaction or series of transactions that results in any of the following:

(i) a merger, consolidation or similar corporate transaction involving (directly or indirectly) the Company and, immediately following which the stockholders of the Company immediately prior thereto do not own, directly or indirectly, outstanding voting securities representing more than 50% of the combined outstanding voting power of the surviving entity in such merger, consolidation or similar corporate transaction or more than 50% of the combined outstanding voting power of the parent of the surviving entity in such merger, consolidation or similar corporate transaction; or

(ii) a sale or other disposition of all or substantially all of the consolidated assets of the Company that occurs over a period of not more than twelve (12) months.

However, a Change in Control will not include (1) any consolidation or merger effected exclusively to change the domicile of the Company, or (2) any transaction or series of transactions principally for bona fide equity financing purposes in which cash is received by the Company or any successor or indebtedness of the Company is cancelled or converted or a combination thereof. In addition, no transaction will be a Change in Control unless it is also "change in ownership of a corporation" or "change in ownership of a substantial portion of a corporation's assets" as defined under in Treasury Regulations Sections 1.409A-3(i)(5)(v) and (vii) without regard to any alternative definitions thereunder.

(c) Good Reason. For purposes of this Agreement, "***Good Reason***" for Executive's resignation of his or her employment will exist following the occurrence of any of the following without Executive's written consent: (i) a material reduction in Executive's base salary, which the parties agree is a reduction of at least 10% of Executive's base salary (provided, however, that such reduction will not be considered Good Reason if made in connection with an across-the-board salary reduction affecting all members of management); (ii) a material reduction in Executive's duties, responsibilities and/or authority; (iii) a relocation of Executive's principal place of employment to a place that increases Executive's one-way commute by more than fifty (50) miles as compared to Executive's then-current principal place of employment immediately prior to such relocation; or (iv) a material breach by the Company of this Agreement. In order to resign for Good Reason, Executive must provide written notice to Board within 30 days after the first occurrence of the event giving rise to Good Reason setting forth the basis for Executive's resignation, allow the Company at least 30 days from receipt of such written notice to cure such event, and if such event is not reasonably cured within such period, Executive must resign from all positions Executive then holds with the Company not later than 30 days after the expiration of the cure period.

5. Parachute Payments.

(a) If any payment or benefit (including payments and benefits pursuant to this Agreement) that Executive would receive in connection with a Change in Control from the Company or otherwise ("***Transaction Payment***") would (i) constitute a "parachute payment" within the meaning of Section 280G of the Code, and (ii) but for this sentence, be subject to the excise tax imposed by Section 4999 of the Code (the "***Excise Tax***"), then the Company shall cause to be determined, before any amounts of the Transaction Payment are paid to Executive, which of the following two alternative forms of payment would result in Executive's receipt, on an after-tax basis, of the greater amount of the Transaction Payment notwithstanding that all or some portion of the Transaction Payment may be subject to the Excise Tax: (1) payment in full of the entire amount of the

Transaction Payment (a "***Full Payment***"), or (2) payment of only a part of the Transaction Payment so that Executive receives the largest payment possible without the imposition of the Excise Tax (a "***Reduced Payment***"). For purposes of determining whether to make a Full Payment or a Reduced Payment, the Company shall cause to be taken into account all applicable federal, state and local income and employment taxes and the Excise Tax (all computed at the highest applicable marginal rate, net of the maximum reduction in federal income taxes which could be obtained from a deduction of such state and local taxes). If a Reduced Payment is made, (x) Executive shall have no rights to any additional payments and/or benefits constituting the Transaction Payment, and (y) reduction in payments and/or benefits shall occur in the manner that results in the greatest economic benefit to Executive as determined in this paragraph. If more than one method of reduction will result in the same economic benefit, the portions of the Transaction Payment shall be reduced pro rata.

(b) The professional firm engaged by the Company for general tax purposes as of the day prior to the effective date of the Change in Control shall make all determinations required to be made under this Section 5. If the professional firm so engaged by the Company is serving as accountant or auditor for the individual, entity or group effecting the Change in Control, the Company shall appoint a nationally recognized independent registered public accounting firm to make the determinations required hereunder. The Company shall bear all expenses with respect to the determinations by such professional firm required to be made hereunder.

(c) The professional firm engaged to make the determinations hereunder shall provide its calculations, together with detailed supporting documentation, to the Company and Executive within fifteen (15) calendar days after the date on which Executive's right to a Transaction Payment is triggered or such other time as reasonably requested by the Company or Executive. If the professional firm determines that no Excise Tax is payable with respect to the Transaction Payment, either before or after the application of the Reduced Amount, it shall furnish the Company and Executive with detailed supporting calculations of its determinations that no Excise Tax will be imposed with respect to such Transaction Payment. Any good faith determinations of the professional firm made hereunder shall be final, binding and conclusive upon the Company and Executive.

6. Other Employment Terms and Conditions. The employment relationship between the parties shall be governed by the general employment policies and procedures of the Company, including those relating to the protection of confidential information and assignment of inventions; provided, however, that when the terms of this Agreement differ from or are in conflict with the Company's general employment policies or procedures, this Agreement shall control.

7. Miscellaneous Provisions.

(a) No Duty to Mitigate. Executive shall not be required to mitigate the amount of any payment contemplated by this Agreement (whether by seeking new employment or in any other manner), nor shall any such payment be reduced by any earnings that Executive may receive from any other source.

(b) Waiver. No provision of this Agreement shall be modified, waived or discharged unless the modification, waiver or discharge is agreed to in writing and signed by Executive and by an authorized officer of the Company (other than Executive). No waiver by either party of any breach of, or of compliance with, any condition or provision of this Agreement by the other party shall be considered a waiver of any other condition or provision or of the same condition or provision at another time.

(c) Whole Agreement. No agreements, representations or understandings (whether oral or written and whether express or implied) which are not expressly set forth in this Agreement have been made or entered into by either party with respect to the subject matter hereof. This Agreement supersedes any agreement (or portion thereof) concerning similar subject matter dated prior to the date of this Agreement, and by execution of this Agreement both parties agree that any such predecessor agreement (or portion thereof) shall be deemed null and void. For the avoidance of doubt, the parties agree that this Agreement does not supersede the provisions of Executive's Employment Terms letter that do not address termination or severance benefits or Executive's Confidential Information and Invention Assignment Agreement with the Company.

(d) Choice of Law. The validity, interpretation, construction and performance of this Agreement shall be governed by the laws of the State of California without reference to conflict of laws provisions, and the parties hereto submit to the exclusive jurisdiction of the state and federal courts of the State of California.

(e) Severability. If any term or provision of this Agreement or the application thereof to any circumstance shall, in any jurisdiction and to any extent, be invalid or unenforceable, such term or provision shall be ineffective as to such jurisdiction to the extent of such invalidity or unenforceability without invalidating or rendering unenforceable the remaining terms and provisions of this Agreement or the application of such terms and provisions to circumstances other than those as to which it is held invalid or unenforceable, and a suitable and equitable term or provision shall be substituted therefor to carry out, insofar as may be valid and enforceable, the intent and purpose of the invalid or unenforceable term or provision.

(f) Legal Fees and Expenses. The parties shall each bear their own expenses, legal fees and other fees incurred in connection with the execution of this Agreement.

(g) No Assignment of Benefits. The rights of any person to payments or benefits under this Agreement shall not be made subject to option or assignment, either by voluntary or involuntary assignment or by operation of law, including (without limitation) bankruptcy, garnishment, attachment or other creditor's process, and any action in violation of this Section 7(g) shall be void.

(h) Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together will constitute one and the same instrument.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date written below.

/s/ Clinton Musil

Clinton Musil

Date: June 2, 2019

PERSONALIS, INC.

By: /s/ Carol Tillis

Carol Tillis, Vice President, Finance and Administration

Date: June 2, 2019

June 2, 2019

Dr. Richard Chen

Re: Employment Terms

Dear Richard,

This Employment Terms letter agreement, including the exhibit hereto (the "Agreement"), confirms the terms and conditions of your continuing employment with Personalis, Inc. ("Personalis" or the "Company").

Position Description

Your position with Personalis is Chief Scientific Officer, reporting directly to the Company's Chief Executive Officer. You will work at the Company's corporate headquarters, and your duties will require business travel.

You will be expected to perform the customary duties of your position, duties specified in the Bylaws of the Company, and as may be required by the Company's Board of Directors (the "Board").

Your employment relationship with the Company will also be governed by the general employment policies and practices of the Company, except that if the terms of this Agreement conflict with such policies and practices, this Agreement will control. Personalis may change your position, duties, and work location from time to time in its discretion.

Exclusive Employment

During your employment with the Company, you will devote your full business time, skill, and attention to your duties and responsibilities, and will perform them faithfully, diligently and competently, and you will use your best efforts to further the business of the Company. You will be expected to be available and working during the Company's regular business hours, and such additional time as appropriate to manage your responsibilities.

While you render services to the Company, you agree that you will not engage in any other employment, consulting, or other business activity for which you receive remuneration, other than service on any board of directors which has been previously disclosed to the Company, without the prior written consent of the Company. During your employment with the Company, you agree that you will not assist any person or entity in competing with the Company, in preparing to compete with the Company or in hiring any employees or consultants of the Company.

Salary

Your current salary is $400,001 annually, less applicable payroll tax withholding and deductions, and is subject to adjustment based on the Company's compensation policies, as in effect from time to time.

Bonus

You are eligible to participate in the Company's annual bonus plan, as adopted by the Board for each bonus year, with a bonus target of 30% of your annual salary, less applicable payroll tax withholding and deductions.

Benefit Programs

As a Company employee, you will continue to be eligible to participate in the applicable employee benefit programs in accordance with their terms, as may be offered by Personalis from time to time in its discretion.

"At-Will" Employment

Your employment with the Company will continue to be "at will," meaning that either you or the Company may terminate your employment at any time, for any lawful reason or no reason, and with or without cause or advance notice. Although your duties, title, compensation, and benefits may change, the "at will" nature of your employment relationship may only be modified in an express written agreement signed by you and the Company.

Severance

You are eligible to receive severance benefits in accordance with the Executive Severance Agreement attached hereto and incorporated as Exhibit A.

Confidential Information

You agree to sign and comply with the Company's standard Employee Confidential Information and Invention Assignment Agreement.

Arbitration

You and the Company both agree that any and all disputes, claims, or causes of action, in law or equity, including but not limited to statutory claims, arising from or relating to the enforcement, breach, performance, or interpretation of this Agreement, your employment with the Company, or the termination of your employment with the Company, will be resolved pursuant to the Federal Arbitration Act, 9 U.S.C. §1-16, and to the fullest extent permitted by law, by final, binding and confidential arbitration conducted in San Jose, California by JAMS, Inc. ("JAMS") or its successors. Both you and the Company acknowledge that by agreeing to this arbitration procedure, ***you and the Company each waive the right to resolve any such dispute through a trial by jury or judge or administrative proceeding***. Any such arbitration proceeding will be governed by JAMS's then applicable rules and procedures for employment disputes, which can be found at http://www.jamsadr.com/rules-employment-arbitration/, and which will be provided to you upon request. In any such proceeding, the arbitrator shall: (a) have the authority to compel adequate discovery for the resolution of the dispute and to award such relief as would otherwise be permitted by law; and (b) issue a written arbitration decision including the arbitrator's essential findings and conclusions and a statement of the award. You and the

Company each shall be entitled to all rights and remedies that either would be entitled to pursue in a court of law. Nothing in this Agreement is intended to prevent either the Company or you from obtaining injunctive relief in court to prevent irreparable harm pending the conclusion of any such arbitration pursuant to applicable law. The Company shall pay all filing fees in excess of those which would be required if the dispute were decided in a court of law, and shall pay the arbitrator's fees and any other fees or costs unique to arbitration.

Entire Agreement; Modification

This Agreement, together with its exhibit, forms the complete and exclusive statement of the terms of your continuing employment with the Company, and supersedes any and all other agreements or promises made to you by anyone, whether oral, written or implied, including without limitation that certain Employment Offer letter agreement dated November 25, 2011 between you and the Company, and that certain Executive Severance Agreement dated September 8, 2017 between you and the Company (together, the "Prior Agreements"). You agree and acknowledge, in consideration of your continuing employment and the compensation and benefits provided to you by the Company, that your continuing employment pursuant to the terms of this Agreement does not constitute and shall not be deemed for any purpose to be a termination of employment giving rise to severance, accelerated vesting, or other benefits under the Prior Agreements or otherwise.

Changes in your employment terms, other than those changes expressly reserved to the Company's discretion in this Agreement, require a written modification signed by Personalis.

Sincerely,

Carol Tillis
Vice President, Finance and Administration

Accepted and agreed this 2nd day of June, 2019

/s/ Richard Chen
Dr. Richard Chen

EXHIBIT A

EXECUTIVE SEVERANCE AGREEMENT

This Executive Severance Agreement (the "***Agreement***") is entered into as of June 2, 2019, by and between Dr. Richard Chen ("***Executive"***) and Personalis, Inc. (the "***Company"***). This Agreement is intended to provide Executive with certain benefits described herein upon the occurrence of specific events.

RECITALS

A. The Company's Board of Directors (the "***Board***") believes it is in the best interests of the Company and its shareholders to retain Executive and provide incentives to Executive to continue in the service of the Company.

B. The Board further believes that it is imperative to provide Executive with certain benefits upon termination of Executive's employment, which benefits are intended to provide Executive with financial security and sufficient income and encouragement to Executive to remain with the Company.

C. To accomplish the foregoing objectives, the Board has directed the Company, upon execution of this Agreement by Executive, to agree to the terms provided in this Agreement.

Now, therefore, in consideration of the mutual promises, covenants and agreements contained herein, the parties hereto agree as follows:

1. At-Will Employment. Executive's employment is at-will, which means that the Company may terminate Executive's employment at any time, with or without Cause or advance notice. Similarly, Executive may resign Executive's employment at any time, with or without advance notice, and with or without Good Reason. Executive shall not receive any compensation of any kind, including, without limitation, equity award vesting acceleration and severance benefits, following Executive's last day of employment with the Company, except as expressly provided herein.

2. Termination in Connection with or Following a Change in Control. If Executive's employment is terminated without Cause (as defined below) (and other than as a result of Executive's death or disability), or Executive resigns for Good Reason (as defined below), in either case within twelve (12) months after the effective date of a Change in Control, and provided such termination constitutes a "separation from service" (within the meaning of Treasury Regulation Section 1.409A-1(h), a "***Separation from Service***"), and provided further that Executive signs and allows to become effective a full

and effective release of claims in favor of the Company in a form provided by the Company (the "***Release***"), within sixty (60) days after Executive's Separation from Service (the date that the Release becomes effective and may no longer be revoked by Executive is referred to as the ***"Release Date"***), then the Company shall provide Executive with the following severance benefits (the "***Change in Control Separation Benefits***"):

(i) The Company shall pay Executive an amount equal to nine (9) months of Executive's then-current base salary, ignoring any decrease in base salary that forms the basis for Good Reason, less all applicable withholdings and deductions, paid in a lump sum within five (5) days after the Release Date (unless the release consideration period begins in one calendar year and ends in a second calendar year, in which case the severance payment shall be paid in the second calendar year).

(ii) Should Executive elect to continue Executive's medical, dental and/or vision insurance benefits pursuant to the Consolidated Omnibus Budget Reconciliation Act of 1985 ("***COBRA***") or any analogous provisions of applicable state law, the Company shall pay Executive's COBRA premiums for Executive and Executive's eligible dependents ("***COBRA Premiums***") for a period of nine (9) months following Executive's termination (the "***Change in Control Benefits Payment Period***"). Notwithstanding the foregoing, if the Company determines, in its sole discretion, that the Company cannot provide the COBRA Premiums without potentially incurring financial costs or penalties under applicable law, the Company shall in lieu thereof pay Executive a taxable cash amount, which payment shall be made regardless of whether Executive elects health care continuation coverage (the "***Health Care Benefit Payment***"). The Health Care Benefit Payment shall be paid in monthly installments on the same schedule that the COBRA Premiums would otherwise have been paid to the insurer. The Health Care Benefit Payment shall be equal to the amount that the Company would have otherwise paid for COBRA premiums (which amount shall be calculated based on the premium for the first month of coverage), and shall be paid until the expiration of the Change in Control Benefits Payment Period.

(iii) The Company shall accelerate the vesting of each of Executive's then-outstanding equity compensation awards such that the awards shall be deemed fully vested as of Executive's Separation from Service.

3. Limitations And Conditions On Covered Separation Benefits

(a) Release Prior to Payment of Benefits. Prior to the payment or provision of any of the Change in Control Separation Benefits, Executive shall execute, and allow to become effective, the Release not later than sixty (60) days following Executive's Separation from Service. Such Release shall specifically relate to all of Executive's rights and claims in existence at the time of such execution and shall confirm Executive's continuing obligations to the Company (including but not limited to obligations under any confidentiality and/or non-solicitation agreement with the Company). No Change in Control Separation Benefits will be paid prior to the Release Date. If the Company (or, if applicable, the successor entity thereto) determines that any of the

Change in Control Separation Benefits constitute "deferred compensation" under Section 409A (defined below), then, solely to the extent necessary to avoid the incurrence of the adverse personal tax consequences under Section 409A, no Change in Control Separation Benefits will be paid prior to the sixtieth (60th) day following Executive's Separation from Service. On the sixtieth (60th) day following the date of Separation from Service, the Company will pay to Executive in a lump sum the applicable Change in Control Separation Benefits that Employee would otherwise have received on or prior to such date, with the balance of the Change in Control Separation Benefits being paid as originally scheduled.

(b) Income and Employment Taxes. Executives agrees that Executive shall be responsible for any applicable taxes of any nature (including any penalties or interest that may apply to such taxes) that the Company reasonably determines apply to any payment made hereunder, that Executive's receipt of any benefit hereunder is conditioned on Executive's satisfaction of any applicable withholding or similar obligations that apply to such benefit, and that any cash payment owed hereunder will be reduced to satisfy any such withholding or similar obligations that may apply.

(c) Compliance with Section 409A. It is intended that each installment of the payments and benefits provided for in this Agreement is a separate "payment" for purposes of Treasury Regulation Section 1.409A-2(b)(2)(i). For the avoidance of doubt, it is intended that payments of the amounts set forth in this Agreement satisfy, to the greatest extent possible, the exemptions from the application of Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***") (Section 409A of the Code, together, with any state law of similar effect, "***Section 409A***") provided under Treasury Regulations 1.409A-1(b)(4), 1.409A-1(b)(5) and 1.409A-1(b)(9). However, if the Company (or, if applicable, the successor entity thereto) determines that the severance payments and benefits provided under this Agreement (the "***Agreement Payments***") constitute "deferred compensation" under Section 409A and Executive is, on the date of his or her Separation from Service, a "specified employee" of the Company or any successor entity thereto, as such term is defined in Section 409A(a)(2)(B)(i) of the Code (a "***Specified Employee***"), then, solely to the extent necessary to avoid the incurrence of the adverse personal tax consequences under Section 409A, the timing of the Covered Separation Benefit described in Section 2(a)(i) or 2(b)(i), as applicable, shall be delayed as follows: on the earlier to occur of (i) the date that is six months and one day after Executive's Separation from Service or (ii) the date of Executive's death (such earlier date, the "***Delayed Initial Payment Date***"), the Company (or the successor entity thereto, as applicable) shall pay to Executive a lump sum amount equal to the applicable benefit that Executive would otherwise have received through the Delayed Initial Payment Date if the commencement of the payment of the benefit had not been so delayed pursuant to this Section 3(c).

(d) Related Matters. Executive further acknowledges and agrees that as a condition to receipt of any severance benefits (i) Executive must comply with Executive's obligations under Executive's Employee Confidential Information and Invention Assignment Agreement; and (ii) resign from all Company and or affiliate positions, including membership on any Board (unless otherwise requested by the Company).

(e) Successors. Any successor to the Company (whether direct or indirect and whether by purchase, lease, merger, consolidation, liquidation or otherwise) to all or substantially all of the Company's business and/or assets shall assume the obligations under this Agreement and agree expressly to perform the obligations under this Agreement in the same manner and to the same extent as the Company would be required to perform such obligations in the absence of a succession. The terms of this Agreement and all of Executive's rights hereunder and thereunder shall inure to the benefit of, and be enforceable by, Executive's personal or legal representatives, executors, administrators, successors, heirs, distributees, devisees and legatees.

(f) Notice. Notices and all other communications contemplated by this Agreement shall be in writing and shall be deemed to have been duly given when personally delivered or when mailed by U.S. registered or certified mail, return receipt requested and postage prepaid. Mailed notices to Executive shall be addressed to Executive at the home address which Executive most recently communicated to the Company in writing. In the case of the Company, mailed notices shall be addressed to its corporate headquarters, and all notices shall be directed to the attention of its Chief Executive Officer.

4. Definitions.

(a) Cause. For purposes of this Agreement, ***"Cause***", as determined by the Board acting in good faith and based on information then known to it, shall mean the occurrence of one or more of the following: (i) Executive's gross negligence or knowing and willful action which is or is likely to be materially injurious to the Company; (ii) any intentional act by Executive in connection with his responsibilities as an employee constituting fraud or a felony crime; (iii) Executive's consistent failure to report for work or perform his duties as directed by the Company's Board of Directors; (iv) persistent or repeated material breach of this Agreement or any agreement between Executive and the Company; (v) Executive becoming disqualified from holding office through his own act or omission; (vi) an unauthorized use or disclosure by the Executive of the Company's confidential information or trade secrets, which use or disclosure causes material harm to the Company; or (vii) a material failure by the Executive to comply with the Company's written policies or rules which is or is likely to be materially injurious to the Company.

(b) Change in Control. For purposes of this Agreement, ***"Change in Control"*** means the consummation of a transaction or series of transactions that results in any of the following:

(i) a merger, consolidation or similar corporate transaction involving (directly or indirectly) the Company and, immediately following which the stockholders of the Company immediately prior thereto do not own, directly or indirectly, outstanding voting securities representing more than 50% of the combined outstanding voting power of the surviving entity in such merger, consolidation or similar corporate transaction or more than 50% of the combined outstanding voting power of the parent of the surviving entity in such merger, consolidation or similar corporate transaction; or

(ii) a sale or other disposition of all or substantially all of the consolidated assets of the Company that occurs over a period of not more than twelve (12) months.

However, a Change in Control will not include (1) any consolidation or merger effected exclusively to change the domicile of the Company, or (2) any transaction or series of transactions principally for bona fide equity financing purposes in which cash is received by the Company or any successor or indebtedness of the Company is cancelled or converted or a combination thereof. In addition, no transaction will be a Change in Control unless it is also "change in ownership of a corporation" or "change in ownership of a substantial portion of a corporation's assets" as defined under in Treasury Regulations Sections 1.409A-3(i)(5)(v) and (vii) without regard to any alternative definitions thereunder.

(c) Good Reason. For purposes of this Agreement, "***Good Reason***" for Executive's resignation of his or her employment will exist following the occurrence of any of the following without Executive's written consent: (i) a material reduction in Executive's base salary, which the parties agree is a reduction of at least 10% of Executive's base salary (provided, however, that such reduction will not be considered Good Reason if made in connection with an across-the-board salary reduction affecting all members of management); (ii) a material reduction in Executive's duties, responsibilities and/or authority; (iii) a relocation of Executive's principal place of employment to a place that increases Executive's one-way commute by more than fifty (50) miles as compared to Executive's then-current principal place of employment immediately prior to such relocation; or (iv) a material breach by the Company of this Agreement. In order to resign for Good Reason, Executive must provide written notice to Board within 30 days after the first occurrence of the event giving rise to Good Reason setting forth the basis for Executive's resignation, allow the Company at least 30 days from receipt of such written notice to cure such event, and if such event is not reasonably cured within such period, Executive must resign from all positions Executive then holds with the Company not later than 30 days after the expiration of the cure period.

5. Parachute Payments.

(a) If any payment or benefit (including payments and benefits pursuant to this Agreement) that Executive would receive in connection with a Change in Control from the Company or otherwise ("***Transaction Payment***") would (i) constitute a "parachute payment" within the meaning of Section 280G of the Code, and (ii) but for this sentence, be subject to the excise tax imposed by Section 4999 of the Code (the "***Excise Tax***"), then the Company shall cause to be determined, before any amounts of the Transaction Payment are paid to Executive, which of the following two alternative forms of payment would result in Executive's receipt, on an after-tax basis, of the greater amount of the Transaction Payment notwithstanding that all or some portion of the Transaction Payment may be subject to the Excise Tax: (1) payment in full of the entire amount of the

Transaction Payment (a "***Full Payment***"), or (2) payment of only a part of the Transaction Payment so that Executive receives the largest payment possible without the imposition of the Excise Tax (a "***Reduced Payment***"). For purposes of determining whether to make a Full Payment or a Reduced Payment, the Company shall cause to be taken into account all applicable federal, state and local income and employment taxes and the Excise Tax (all computed at the highest applicable marginal rate, net of the maximum reduction in federal income taxes which could be obtained from a deduction of such state and local taxes). If a Reduced Payment is made, (x) Executive shall have no rights to any additional payments and/or benefits constituting the Transaction Payment, and (y) reduction in payments and/or benefits shall occur in the manner that results in the greatest economic benefit to Executive as determined in this paragraph. If more than one method of reduction will result in the same economic benefit, the portions of the Transaction Payment shall be reduced pro rata.

(b) The professional firm engaged by the Company for general tax purposes as of the day prior to the effective date of the Change in Control shall make all determinations required to be made under this Section 5. If the professional firm so engaged by the Company is serving as accountant or auditor for the individual, entity or group effecting the Change in Control, the Company shall appoint a nationally recognized independent registered public accounting firm to make the determinations required hereunder. The Company shall bear all expenses with respect to the determinations by such professional firm required to be made hereunder.

(c) The professional firm engaged to make the determinations hereunder shall provide its calculations, together with detailed supporting documentation, to the Company and Executive within fifteen (15) calendar days after the date on which Executive's right to a Transaction Payment is triggered or such other time as reasonably requested by the Company or Executive. If the professional firm determines that no Excise Tax is payable with respect to the Transaction Payment, either before or after the application of the Reduced Amount, it shall furnish the Company and Executive with detailed supporting calculations of its determinations that no Excise Tax will be imposed with respect to such Transaction Payment. Any good faith determinations of the professional firm made hereunder shall be final, binding and conclusive upon the Company and Executive.

6. Other Employment Terms and Conditions. The employment relationship between the parties shall be governed by the general employment policies and procedures of the Company, including those relating to the protection of confidential information and assignment of inventions; provided, however, that when the terms of this Agreement differ from or are in conflict with the Company's general employment policies or procedures, this Agreement shall control.

7. Miscellaneous Provisions.

(a) No Duty to Mitigate. Executive shall not be required to mitigate the amount of any payment contemplated by this Agreement (whether by seeking new employment or in any other manner), nor shall any such payment be reduced by any earnings that Executive may receive from any other source.

(b) Waiver. No provision of this Agreement shall be modified, waived or discharged unless the modification, waiver or discharge is agreed to in writing and signed by Executive and by an authorized officer of the Company (other than Executive). No waiver by either party of any breach of, or of compliance with, any condition or provision of this Agreement by the other party shall be considered a waiver of any other condition or provision or of the same condition or provision at another time.

(c) Whole Agreement. No agreements, representations or understandings (whether oral or written and whether express or implied) which are not expressly set forth in this Agreement have been made or entered into by either party with respect to the subject matter hereof. This Agreement supersedes any agreement (or portion thereof) concerning similar subject matter dated prior to the date of this Agreement, and by execution of this Agreement both parties agree that any such predecessor agreement (or portion thereof) shall be deemed null and void. For the avoidance of doubt, the parties agree that this Agreement does not supersede the provisions of Executive's Employment Terms letter that do not address termination or severance benefits or Executive's Confidential Information and Invention Assignment Agreement with the Company.

(d) Choice of Law. The validity, interpretation, construction and performance of this Agreement shall be governed by the laws of the State of California without reference to conflict of laws provisions, and the parties hereto submit to the exclusive jurisdiction of the state and federal courts of the State of California.

(e) Severability. If any term or provision of this Agreement or the application thereof to any circumstance shall, in any jurisdiction and to any extent, be invalid or unenforceable, such term or provision shall be ineffective as to such jurisdiction to the extent of such invalidity or unenforceability without invalidating or rendering unenforceable the remaining terms and provisions of this Agreement or the application of such terms and provisions to circumstances other than those as to which it is held invalid or unenforceable, and a suitable and equitable term or provision shall be substituted therefor to carry out, insofar as may be valid and enforceable, the intent and purpose of the invalid or unenforceable term or provision.

(f) Legal Fees and Expenses. The parties shall each bear their own expenses, legal fees and other fees incurred in connection with the execution of this Agreement.

(g) No Assignment of Benefits. The rights of any person to payments or benefits under this Agreement shall not be made subject to option or assignment, either by voluntary or involuntary assignment or by operation of law, including (without limitation) bankruptcy, garnishment, attachment or other creditor's process, and any action in violation of this Section 7(g) shall be void.

(h) Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together will constitute one and the same instrument.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date written below.

/s/ Richard Chen
Dr. Richard Chen

Date: June 2, 2019

PERSONALIS, INC.

By: /s/ Carol Tillis
Carol Tillis, Vice President, Finance and Administration

Date: June 2, 2019

June 2, 2019

Aaron Tachibana

Re: Employment Terms

Dear Aaron,

This Employment Terms letter agreement, including the exhibit hereto (the "Agreement"), confirms the terms and conditions of your continuing employment with Personalis, Inc. ("Personalis" or the "Company").

Position Description

Your position with Personalis is Chief Financial Officer, reporting to the Company's Chief Executive Officer, the Company's Board of Directors (the "Board") and the Audit Committee of the Board. You will work at the Company's corporate headquarters, and your duties will require business travel.

You will be expected to perform the customary duties of your position, duties specified in the Bylaws of the Company, and as may be required by the Board.

Your employment relationship with the Company will also be governed by the general employment policies and practices of the Company, except that if the terms of this Agreement conflict with such policies and practices, this Agreement will control. Personalis may change your position, duties, and work location from time to time in its discretion.

Exclusive Employment

During your employment with the Company, you will devote your full business time, skill, and attention to your duties and responsibilities, and will perform them faithfully, diligently and competently, and you will use your best efforts to further the business of the Company. You will be expected to be available and working during the Company's regular business hours, and such additional time as appropriate to manage your responsibilities.

While you render services to the Company, you agree that you will not engage in any other employment, consulting, or other business activity for which you receive remuneration, other than service on any board of directors which has been previously disclosed to the Company, without the prior written consent of the Company. During your employment with the Company, you agree that you will not assist any person or entity in competing with the Company, in preparing to compete with the Company or in hiring any employees or consultants of the Company.

Salary

Your current salary is $350,000 annually, less applicable payroll tax withholding and deductions, and is subject to adjustment based on the Company's compensation policies, as in effect from time to time.

Bonus

You are eligible to participate in the Company's annual bonus plan, as adopted by the Board for each bonus year, with a bonus target of 30% of your annual salary, less applicable payroll tax withholding and deductions.

Benefit Programs

As a Company employee, you will continue to be eligible to participate in the applicable employee benefit programs in accordance with their terms, as may be offered by Personalis from time to time in its discretion.

"At-Will" Employment

Your employment with the Company will continue to be "at will," meaning that either you or the Company may terminate your employment at any time, for any lawful reason or no reason, and with or without cause or advance notice. Although your duties, title, compensation, and benefits may change, the "at will" nature of your employment relationship may only be modified in an express written agreement signed by you and the Company.

Severance

You are eligible to receive severance benefits in accordance with the Executive Severance Agreement attached hereto and incorporated as Exhibit A.

Confidential Information

You agree to sign and comply with the Company's standard Employee Confidential Information and Invention Assignment Agreement.

Arbitration

You and the Company both agree that any and all disputes, claims, or causes of action, in law or equity, including but not limited to statutory claims, arising from or relating to the enforcement, breach, performance, or interpretation of this Agreement, your employment with the Company, or the termination of your employment with the Company, will be resolved pursuant to the Federal Arbitration Act, 9 U.S.C. §1-16, and to the fullest extent permitted by law, by final, binding and confidential arbitration conducted in San Jose, California by JAMS, Inc. ("JAMS") or its successors. Both you and the Company acknowledge that by agreeing to this arbitration procedure, ***you and the Company each waive the right to resolve any such dispute through a trial by jury or judge or administrative proceeding***. Any such arbitration proceeding will be governed by JAMS's then applicable rules and procedures for employment disputes, which can be found at http://www.jamsadr.com/rules-employment-arbitration/, and which will be provided to you upon request. In any such proceeding, the arbitrator shall: (a) have the authority to compel adequate discovery for the resolution of the dispute and to award such relief as would otherwise be permitted by law; and (b) issue a written arbitration decision including the arbitrator's essential findings and conclusions and a statement of the award. You and the

Company each shall be entitled to all rights and remedies that either would be entitled to pursue in a court of law. Nothing in this Agreement is intended to prevent either the Company or you from obtaining injunctive relief in court to prevent irreparable harm pending the conclusion of any such arbitration pursuant to applicable law. The Company shall pay all filing fees in excess of those which would be required if the dispute were decided in a court of law, and shall pay the arbitrator's fees and any other fees or costs unique to arbitration.

Entire Agreement; Modification

This Agreement, together with its exhibit, forms the complete and exclusive statement of the terms of your continuing employment with the Company, and supersedes any and all other agreements or promises made to you by anyone, whether oral, written or implied, including without limitation that certain Employment Offer letter agreement dated December 14, 2018 between you and the Company (the "Prior Agreement"). You agree and acknowledge, in consideration of your continuing employment and the compensation and benefits provided to you by the Company, that your continuing employment pursuant to the terms of this Agreement does not constitute and shall not be deemed for any purpose to be a termination of employment giving rise to severance, accelerated vesting, or other benefits under the Prior Agreement or otherwise.

Changes in your employment terms, other than those changes expressly reserved to the Company's discretion in this Agreement, require a written modification signed by Personalis.

Sincerely,

Carol Tillis
Vice President, Finance and Administration

Accepted and agreed this 2nd day of June, 2019

/s/ Aaron Tachibana
Aaron Tachibana

EXHIBIT A

EXECUTIVE SEVERANCE AGREEMENT

This Executive Severance Agreement (the "***Agreement***") is entered into as of June 2, 2019, by and between Aaron Tachibana ("***Executive"***) and Personalis, Inc. (the "***Company"***). This Agreement is intended to provide Executive with certain benefits described herein upon the occurrence of specific events.

RECITALS

A. The Company's Board of Directors (the "***Board***") believes it is in the best interests of the Company and its shareholders to retain Executive and provide incentives to Executive to continue in the service of the Company.

B. The Board further believes that it is imperative to provide Executive with certain benefits upon termination of Executive's employment, which benefits are intended to provide Executive with financial security and sufficient income and encouragement to Executive to remain with the Company.

C. To accomplish the foregoing objectives, the Board has directed the Company, upon execution of this Agreement by Executive, to agree to the terms provided in this Agreement.

Now, therefore, in consideration of the mutual promises, covenants and agreements contained herein, the parties hereto agree as follows:

1. At-Will Employment. Executive's employment is at-will, which means that the Company may terminate Executive's employment at any time, with or without Cause or advance notice. Similarly, Executive may resign Executive's employment at any time, with or without advance notice, and with or without Good Reason. Executive shall not receive any compensation of any kind, including, without limitation, equity award vesting acceleration and severance benefits, following Executive's last day of employment with the Company, except as expressly provided herein.

2. Termination in Connection with or Following a Change in Control. If Executive's employment is terminated without Cause (as defined below) (and other than as a result of Executive's death or disability), or Executive resigns for Good Reason (as defined below), in either case within twelve (12) months after the effective date of a Change in Control, and provided such termination constitutes a "separation from service" (within the meaning of Treasury Regulation Section 1.409A-1(h), a "***Separation from Service***"), and provided further that Executive signs and allows to become effective a full

and effective release of claims in favor of the Company in a form provided by the Company (the "***Release***"), within sixty (60) days after Executive's Separation from Service (the date that the Release becomes effective and may no longer be revoked by Executive is referred to as the ***"Release Date"***), then the Company shall provide Executive with the following severance benefits (the "***Change in Control Separation Benefits***"):

(i) The Company shall pay Executive an amount equal to twelve (12) months of Executive's then-current base salary, ignoring any decrease in base salary that forms the basis for Good Reason, less all applicable withholdings and deductions, paid in a lump sum within five (5) days after the Release Date (unless the release consideration period begins in one calendar year and ends in a second calendar year, in which case the severance payment shall be paid in the second calendar year).

(ii) Should Executive elect to continue Executive's medical, dental and/or vision insurance benefits pursuant to the Consolidated Omnibus Budget Reconciliation Act of 1985 ("***COBRA***") or any analogous provisions of applicable state law, the Company shall pay Executive's COBRA premiums for Executive and Executive's eligible dependents ("***COBRA Premiums***") for a period of twelve (12) months following Executive's termination (the "***Change in Control Benefits Payment Period***"). Notwithstanding the foregoing, if the Company determines, in its sole discretion, that the Company cannot provide the COBRA Premiums without potentially incurring financial costs or penalties under applicable law, the Company shall in lieu thereof pay Executive a taxable cash amount, which payment shall be made regardless of whether Executive elects health care continuation coverage (the "***Health Care Benefit Payment***"). The Health Care Benefit Payment shall be paid in monthly installments on the same schedule that the COBRA Premiums would otherwise have been paid to the insurer. The Health Care Benefit Payment shall be equal to the amount that the Company would have otherwise paid for COBRA premiums (which amount shall be calculated based on the premium for the first month of coverage), and shall be paid until the expiration of the Change in Control Benefits Payment Period.

(iii) The Company shall accelerate the vesting of each of Executive's then-outstanding equity compensation awards such that the awards shall be deemed fully vested as of Executive's Separation from Service.

3. Limitations And Conditions On Covered Separation Benefits

(a) Release Prior to Payment of Benefits. Prior to the payment or provision of any of the Change in Control Separation Benefits, Executive shall execute, and allow to become effective, the Release not later than sixty (60) days following Executive's Separation from Service. Such Release shall specifically relate to all of Executive's rights and claims in existence at the time of such execution and shall confirm Executive's continuing obligations to the Company (including but not limited to obligations under any confidentiality and/or non-solicitation agreement with the Company). No Change in Control Separation Benefits will be paid prior to the Release Date. If the Company (or, if applicable, the successor entity thereto) determines that any of the

Change in Control Separation Benefits constitute "deferred compensation" under Section 409A (defined below), then, solely to the extent necessary to avoid the incurrence of the adverse personal tax consequences under Section 409A, no Change in Control Separation Benefits will be paid prior to the sixtieth (60th) day following Executive's Separation from Service. On the sixtieth (60th) day following the date of Separation from Service, the Company will pay to Executive in a lump sum the applicable Change in Control Separation Benefits that Employee would otherwise have received on or prior to such date, with the balance of the Change in Control Separation Benefits being paid as originally scheduled.

(b) Income and Employment Taxes. Executives agrees that Executive shall be responsible for any applicable taxes of any nature (including any penalties or interest that may apply to such taxes) that the Company reasonably determines apply to any payment made hereunder, that Executive's receipt of any benefit hereunder is conditioned on Executive's satisfaction of any applicable withholding or similar obligations that apply to such benefit, and that any cash payment owed hereunder will be reduced to satisfy any such withholding or similar obligations that may apply.

(c) Compliance with Section 409A. It is intended that each installment of the payments and benefits provided for in this Agreement is a separate "payment" for purposes of Treasury Regulation Section 1.409A-2(b)(2)(i). For the avoidance of doubt, it is intended that payments of the amounts set forth in this Agreement satisfy, to the greatest extent possible, the exemptions from the application of Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***") (Section 409A of the Code, together, with any state law of similar effect, "***Section 409A***") provided under Treasury Regulations 1.409A-1(b)(4), 1.409A-1(b)(5) and 1.409A-1(b)(9). However, if the Company (or, if applicable, the successor entity thereto) determines that the severance payments and benefits provided under this Agreement (the "***Agreement Payments***") constitute "deferred compensation" under Section 409A and Executive is, on the date of his or her Separation from Service, a "specified employee" of the Company or any successor entity thereto, as such term is defined in Section 409A(a)(2)(B)(i) of the Code (a "***Specified Employee***"), then, solely to the extent necessary to avoid the incurrence of the adverse personal tax consequences under Section 409A, the timing of the Covered Separation Benefit described in Section 2(a)(i) or 2(b)(i), as applicable, shall be delayed as follows: on the earlier to occur of (i) the date that is six months and one day after Executive's Separation from Service or (ii) the date of Executive's death (such earlier date, the "***Delayed Initial Payment Date***"), the Company (or the successor entity thereto, as applicable) shall pay to Executive a lump sum amount equal to the applicable benefit that Executive would otherwise have received through the Delayed Initial Payment Date if the commencement of the payment of the benefit had not been so delayed pursuant to this Section 3(c).

(d) Related Matters. Executive further acknowledges and agrees that as a condition to receipt of any severance benefits (i) Executive must comply with Executive's obligations under Executive's Employee Confidential Information and Invention Assignment Agreement; and (ii) resign from all Company and or affiliate positions, including membership on any Board (unless otherwise requested by the Company).

(e) Successors. Any successor to the Company (whether direct or indirect and whether by purchase, lease, merger, consolidation, liquidation or otherwise) to all or substantially all of the Company's business and/or assets shall assume the obligations under this Agreement and agree expressly to perform the obligations under this Agreement in the same manner and to the same extent as the Company would be required to perform such obligations in the absence of a succession. The terms of this Agreement and all of Executive's rights hereunder and thereunder shall inure to the benefit of, and be enforceable by, Executive's personal or legal representatives, executors, administrators, successors, heirs, distributees, devisees and legatees.

(f) Notice. Notices and all other communications contemplated by this Agreement shall be in writing and shall be deemed to have been duly given when personally delivered or when mailed by U.S. registered or certified mail, return receipt requested and postage prepaid. Mailed notices to Executive shall be addressed to Executive at the home address which Executive most recently communicated to the Company in writing. In the case of the Company, mailed notices shall be addressed to its corporate headquarters, and all notices shall be directed to the attention of its Chief Executive Officer.

4. Definitions.

(a) Cause. For purposes of this Agreement, ***"Cause***", as determined by the Board acting in good faith and based on information then known to it, shall mean the occurrence of one or more of the following: (i) Executive's gross negligence or knowing and willful action which is or is likely to be materially injurious to the Company; (ii) any intentional act by Executive in connection with his responsibilities as an employee constituting fraud or a felony crime; (iii) Executive's consistent failure to report for work or perform his duties as directed by the Company's Board of Directors; (iv) persistent or repeated material breach of this Agreement or any agreement between Executive and the Company; (v) Executive becoming disqualified from holding office through his own act or omission; (vi) an unauthorized use or disclosure by the Executive of the Company's confidential information or trade secrets, which use or disclosure causes material harm to the Company; or (vii) a material failure by the Executive to comply with the Company's written policies or rules which is or is likely to be materially injurious to the Company.

(b) Change in Control. For purposes of this Agreement, ***"Change in Control"*** means the consummation of a transaction or series of transactions that results in any of the following:

(i) a merger, consolidation or similar corporate transaction involving (directly or indirectly) the Company and, immediately following which the stockholders of the Company immediately prior thereto do not own, directly or indirectly, outstanding voting securities representing more than 50% of the combined outstanding voting power of the surviving entity in such merger, consolidation or similar corporate transaction or more than 50% of the combined outstanding voting power of the parent of the surviving entity in such merger, consolidation or similar corporate transaction; or

(ii) a sale or other disposition of all or substantially all of the consolidated assets of the Company that occurs over a period of not more than twelve (12) months.

However, a Change in Control will not include (1) any consolidation or merger effected exclusively to change the domicile of the Company, or (2) any transaction or series of transactions principally for bona fide equity financing purposes in which cash is received by the Company or any successor or indebtedness of the Company is cancelled or converted or a combination thereof. In addition, no transaction will be a Change in Control unless it is also "change in ownership of a corporation" or "change in ownership of a substantial portion of a corporation's assets" as defined under in Treasury Regulations Sections 1.409A-3(i)(5)(v) and (vii) without regard to any alternative definitions thereunder.

(c) Good Reason. For purposes of this Agreement, "***Good Reason***" for Executive's resignation of his or her employment will exist following the occurrence of any of the following without Executive's written consent: (i) a material reduction in Executive's base salary, which the parties agree is a reduction of at least 10% of Executive's base salary (provided, however, that such reduction will not be considered Good Reason if made in connection with an across-the-board salary reduction affecting all members of management); (ii) a material reduction in Executive's duties, responsibilities and/or authority; (iii) a relocation of Executive's principal place of employment to a place that increases Executive's one-way commute by more than fifty (50) miles as compared to Executive's then-current principal place of employment immediately prior to such relocation; or (iv) a material breach by the Company of this Agreement. In order to resign for Good Reason, Executive must provide written notice to Board within 30 days after the first occurrence of the event giving rise to Good Reason setting forth the basis for Executive's resignation, allow the Company at least 30 days from receipt of such written notice to cure such event, and if such event is not reasonably cured within such period, Executive must resign from all positions Executive then holds with the Company not later than 30 days after the expiration of the cure period.

5. Parachute Payments.

(a) If any payment or benefit (including payments and benefits pursuant to this Agreement) that Executive would receive in connection with a Change in Control from the Company or otherwise ("***Transaction Payment***") would (i) constitute a "parachute payment" within the meaning of Section 280G of the Code, and (ii) but for this sentence, be subject to the excise tax imposed by Section 4999 of the Code (the "***Excise Tax***"), then the Company shall cause to be determined, before any amounts of the Transaction Payment are paid to Executive, which of the following two alternative forms of payment would result in Executive's receipt, on an after-tax basis, of the greater amount of the Transaction Payment notwithstanding that all or some portion of the Transaction Payment may be subject to the Excise Tax: (1) payment in full of the entire amount of the

Transaction Payment (a "***Full Payment***"), or (2) payment of only a part of the Transaction Payment so that Executive receives the largest payment possible without the imposition of the Excise Tax (a "***Reduced Payment***"). For purposes of determining whether to make a Full Payment or a Reduced Payment, the Company shall cause to be taken into account all applicable federal, state and local income and employment taxes and the Excise Tax (all computed at the highest applicable marginal rate, net of the maximum reduction in federal income taxes which could be obtained from a deduction of such state and local taxes). If a Reduced Payment is made, (x) Executive shall have no rights to any additional payments and/or benefits constituting the Transaction Payment, and (y) reduction in payments and/or benefits shall occur in the manner that results in the greatest economic benefit to Executive as determined in this paragraph. If more than one method of reduction will result in the same economic benefit, the portions of the Transaction Payment shall be reduced pro rata.

(b) The professional firm engaged by the Company for general tax purposes as of the day prior to the effective date of the Change in Control shall make all determinations required to be made under this Section 5. If the professional firm so engaged by the Company is serving as accountant or auditor for the individual, entity or group effecting the Change in Control, the Company shall appoint a nationally recognized independent registered public accounting firm to make the determinations required hereunder. The Company shall bear all expenses with respect to the determinations by such professional firm required to be made hereunder.

(c) The professional firm engaged to make the determinations hereunder shall provide its calculations, together with detailed supporting documentation, to the Company and Executive within fifteen (15) calendar days after the date on which Executive's right to a Transaction Payment is triggered or such other time as reasonably requested by the Company or Executive. If the professional firm determines that no Excise Tax is payable with respect to the Transaction Payment, either before or after the application of the Reduced Amount, it shall furnish the Company and Executive with detailed supporting calculations of its determinations that no Excise Tax will be imposed with respect to such Transaction Payment. Any good faith determinations of the professional firm made hereunder shall be final, binding and conclusive upon the Company and Executive.

6. Other Employment Terms and Conditions. The employment relationship between the parties shall be governed by the general employment policies and procedures of the Company, including those relating to the protection of confidential information and assignment of inventions; provided, however, that when the terms of this Agreement differ from or are in conflict with the Company's general employment policies or procedures, this Agreement shall control.

7. Miscellaneous Provisions.

(a) No Duty to Mitigate. Executive shall not be required to mitigate the amount of any payment contemplated by this Agreement (whether by seeking new employment or in any other manner), nor shall any such payment be reduced by any earnings that Executive may receive from any other source.

(b) Waiver. No provision of this Agreement shall be modified, waived or discharged unless the modification, waiver or discharge is agreed to in writing and signed by Executive and by an authorized officer of the Company (other than Executive). No waiver by either party of any breach of, or of compliance with, any condition or provision of this Agreement by the other party shall be considered a waiver of any other condition or provision or of the same condition or provision at another time.

(c) Whole Agreement. No agreements, representations or understandings (whether oral or written and whether express or implied) which are not expressly set forth in this Agreement have been made or entered into by either party with respect to the subject matter hereof. This Agreement supersedes any agreement (or portion thereof) concerning similar subject matter dated prior to the date of this Agreement, and by execution of this Agreement both parties agree that any such predecessor agreement (or portion thereof) shall be deemed null and void. For the avoidance of doubt, the parties agree that this Agreement does not supersede the provisions of Executive's Employment Terms letter that do not address termination or severance benefits or Executive's Confidential Information and Invention Assignment Agreement with the Company.

(d) Choice of Law. The validity, interpretation, construction and performance of this Agreement shall be governed by the laws of the State of California without reference to conflict of laws provisions, and the parties hereto submit to the exclusive jurisdiction of the state and federal courts of the State of California.

(e) Severability. If any term or provision of this Agreement or the application thereof to any circumstance shall, in any jurisdiction and to any extent, be invalid or unenforceable, such term or provision shall be ineffective as to such jurisdiction to the extent of such invalidity or unenforceability without invalidating or rendering unenforceable the remaining terms and provisions of this Agreement or the application of such terms and provisions to circumstances other than those as to which it is held invalid or unenforceable, and a suitable and equitable term or provision shall be substituted therefor to carry out, insofar as may be valid and enforceable, the intent and purpose of the invalid or unenforceable term or provision.

(f) Legal Fees and Expenses. The parties shall each bear their own expenses, legal fees and other fees incurred in connection with the execution of this Agreement.

(g) No Assignment of Benefits. The rights of any person to payments or benefits under this Agreement shall not be made subject to option or assignment, either by voluntary or involuntary assignment or by operation of law, including (without limitation) bankruptcy, garnishment, attachment or other creditor's process, and any action in violation of this Section 7(g) shall be void.

(h) Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together will constitute one and the same instrument.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date written below.

/s/ Aaron Tachibana
Aaron Tachibana

Date: June 2, 2019

PERSONALIS, INC.

By: /s/ Carol Tillis
Carol Tillis, Vice President, Finance and Administration

Date: June 2, 2019

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the use in this Amendment No. 1 to Registration Statement No. 333-231703 on Form S-1 of our report dated March 27, 2019 (June 4, 2019 as to effects of the reverse stock split described in the second paragraph in Note 2) relating to the consolidated financial statements of Personalis, Inc. and subsidiary appearing in the Prospectus, which is part of this Registration Statement.

We also consent to the reference to us under the headings “Experts” in such Prospectus.

/s/ DELOITTE & TOUCHE LLP

San Jose, California
June 7, 2019