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As filed with the Securities and Exchange Commission on August 15, 2018

Registration No. 333-225970

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

Amendment No. 5
to
FORM S-1
REGISTRATION STATEMENT
UNDER
THE SECURITIES ACT OF 1933

Bionano Genomics, Inc.

(Exact Name of Registrant as Specified in its Charter)

Delaware	3826	26-1756290
(State or Other Jurisdiction of Incorporation or Organization)	(Primary Standard Industrial Classification Code Number)	(I.R.S. Employer Identification Number)

Bionano Genomics, Inc.
9640 Towne Centre Drive, Suite 100
San Diego, California 92121
(858) 888-7600
(Address, Including Zip Code, and Telephone Number, Including Area Code, of Registrant's Principal Executive Offices)

R. Erik Holmlin, Ph.D.
President and Chief Executive Officer
Bionano Genomics, Inc.
9640 Towne Centre Drive, Suite 100
San Diego, California 92121
(858) 888-7600
(Name, address, including zip code, and telephone number, including area code, of agent for service)

Copies to:

Thomas A. Coll, Esq. Kenneth J. Rollins, Esq. James C. Pennington, Esq. Cooley LLP 4401 Eastgate Mall San Diego, California 92121 (858) 550-6000	R. Erik Holmlin, Ph.D. President and Chief Executive Officer Bionano Genomics, Inc. 9640 Towne Centre Drive, Suite 100 San Diego, California 92121 (858) 888-7600	Mitchell Nussbaum, Esq. Angela Dowd, Esq. Loeb & Loeb LLP 345 Park Ave. New York, NY 10154 (212) 407-4000

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

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

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

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

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

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, 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	☐ (Do not check if a smaller reporting company)	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 to Section 7(a)(2)(B) of the Securities Act. ☐

CALCULATION OF REGISTRATION FEE

Title of each class of securities to be registered	Proposed maximum aggregate offering price(1)	Amount of registration fee(1)
Units, each consisting of one share of common stock, $0.0001 par value per share, and one warrant to purchase one share of common stock(2),(3)	$19,722,500	$2,456
Common stock included in the units(3),(4),(5)	—	—
Warrants to purchase common stock included in the units(3),(5)	—	—
Common stock, $0.0001 par value per share, underlying the warrants included in the units(3),(4),(6)	$19,722,500	$2,456
Total(7)	$39,445,000	$4,912

(1) Estimated solely for the purpose of computing the amount of registration fee pursuant to Rule 457(o) under the Securities Act of 1933, as amended, or the Securities Act.
(2) Includes the offering price of units that the underwriters have the option to purchase to cover over-allotments, if any.
(3) Each unit will consist of one share of common stock and one warrant to purchase one share of common stock.
(4) Pursuant to Rule 416 of the Securities Act, the securities being registered hereunder include such additional securities as may be issued after the date hereof as a result of share splits, share dividends or similar transactions.
(5) No fee required pursuant to Rule 457(g) under the Securities Act.
(6) We have calculated the proposed maximum aggregate offering price of the common stock underlying the warrants to purchase common stock by assuming that such warrants are exercisable to purchase common stock at a price per share equal to $7.00.
(7) The Registrant previously paid a registration fee of $4,797 in connection with the 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 will file a further amendment which specifically states that this Registration Statement will thereafter become effective in accordance with Section 8(a) of the Securities Act of 1933, as amended, or until the Registration Statement will become effective on such date as the Securities and Exchange 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 related to these securities filed with the Securities and Exchange Commission is declared effective. This prospectus is not an offer to sell or a solicitation of an offer to buy these securities and we are not soliciting offers to buy these securities in any state where the offer or sale is not permitted.

PRELIMINARY PROSPECTUS SUBJECT TO COMPLETION, DATED AUGUST 15, 2018

2,450,000 Units

This is our initial public offering. We are offering up to 2,450,000 units (each unit consisting of one share of our common stock and one warrant to purchase one share of our common stock) pursuant to this prospectus. Each warrant to purchase common stock contained in a unit entitles the holder to purchase one share of our common stock at an initial exercise price of $ per share (100% of the offering price per unit), subject to adjustment. Each such warrant will become exercisable 30 days after the date of this prospectus or on such date the underwriters separate the units, whichever date is earlier, and will expire five years from the date of this prospectus. The initial public offering price of one unit is expected to be between $6.00 and $7.00.

Our common stock has been approved for listing on The Nasdaq Stock Market LLC under the symbol "BNGO" and we have applied for the listing on The Nasdaq Stock Market LLC of the units and the warrants under the symbols "BNGOU" and "BNGOW," respectively.

The warrants and shares of our common stock will trade together as units only during the first 30 days following the date of this prospectus, and thereafter the units will automatically separate and the common stock and warrants will trade separately, unless Roth Capital Partners, LLC, as the representative of the underwriters, determines that an earlier date is acceptable based upon, among other things, its assessment of the relative strengths of the securities markets and small capitalization companies in general, and the trading pattern of, and demand for, our securities in particular.

We are an "emerging growth company" as defined by the Jumpstart Our Business Startups Act of 2012, and as such, have elected to comply with reduced public company reporting requirements and may elect to comply with reduced public company reporting requirements in future filings.

Investing in our securities involves risks. See "Risk Factors" beginning on page 14 of this prospectus for a discussion of the risks that you should consider in connection with an investment in our securities.

	Per Unit	Total
Initial public offering price	$	$
Underwriting discounts and commissions(1)	$	$
Proceeds to Bionano Genomics, Inc. (before expenses)	$	$

(1) See "Underwriting" beginning on page 149 for additional information regarding underwriting compensation.

We have granted the underwriters an option to buy up to an additional 367,500 units from us at the initial public offering price, less the underwriting discounts and commissions, to cover over-allotments, if any. The underwriters may exercise this option at any time during the 30-day period from the date of this prospectus.

Certain of our existing stockholders, including entities affiliated with them or with certain of our directors, have indicated an interest in purchasing an aggregate of approximately $8.0 million in units in this offering at the initial public offering price per unit. However, because indications of interest are not binding agreements or commitments to purchase, the underwriters may determine to sell more, less or no units in this offering to any of these persons or entities, or any of these persons or entities may determine to purchase more, less or no units in this offering. The underwriters will receive the same underwriting discount on any units purchased by these persons or entities as they will on any other units sold to the public in this offering.

The underwriters expect to deliver the units against payment on or about , 2018.

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

Sole Book-Running Manager

Roth Capital Partners

Lead Manager

Maxim Group LLC

Co-Manager

LifeSci Capital LLC

The date of this prospectus is , 2018.

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Neither we nor any of the underwriters have authorized anyone to provide you with any information or to make any representations other than as contained in this prospectus or in any free writing prospectuses we have prepared. Neither we nor the underwriters take responsibility for, and provide no assurance about the reliability of, any information that others may give you. This prospectus is an offer to sell only the securities offered hereby, but only under circumstances and in jurisdictions where it is lawful to do so. The information contained in this prospectus is accurate only as of the date of this prospectus, regardless of the time of delivery of this prospectus or any sale of the securities. Our business, financial condition, results of operations and prospects may have changed since that date.

Unless otherwise indicated, all references in this prospectus to "Bionano," the "company," "we," "our," "us" or similar terms refer to Bionano Genomics, Inc. and its subsidiaries.

No action is being taken in any jurisdiction outside the U.S. to permit a public offering of our securities or possession or distribution of this prospectus in any such jurisdiction. Persons who come into possession of this prospectus in jurisdictions outside the U.S. are required to inform themselves about and to observe any restrictions about this offering and the distribution of this prospectus applicable to those jurisdictions.

Through and including , 2018 (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.

PROSPECTUS SUMMARY

This summary highlights information contained elsewhere in this prospectus. This summary does not contain all of the information you should consider before investing in our securities. You should read this entire prospectus carefully, including "Risk Factors," "Management's Discussion and Analysis of Financial Condition and Results of Operations," and our financial statements and the related notes included elsewhere in this prospectus, before making an investment decision.

BIONANO GENOMICS, INC.

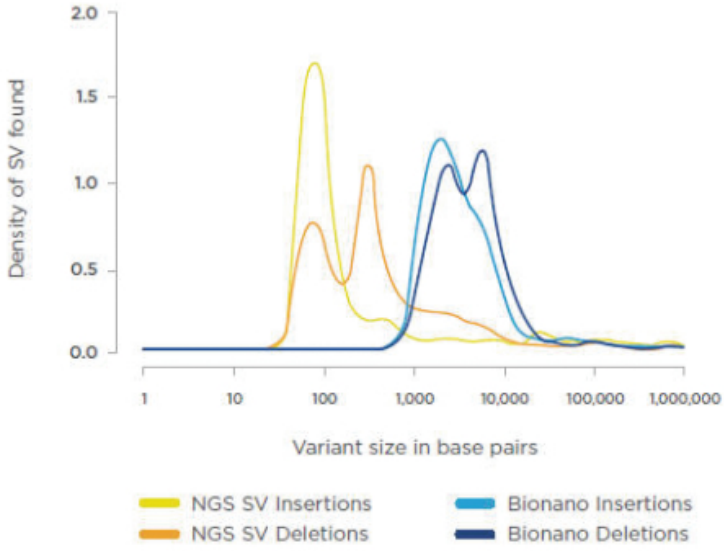
Overview

We are a life sciences instrumentation company in the genome analysis space. We develop and market the Saphyr system, a platform for ultra-sensitive and ultra-specific structural variation detection that enables researchers and clinicians to accelerate the search for new diagnostics and therapeutic targets and to streamline the study of changes in chromosomes, which is known as cytogenetics. Our Saphyr system comprises an instrument, chip consumables, reagents and a suite of data analysis tools.

Structural variation refers to large-scale structural differences in the genomic DNA of one individual compared to another. Each structural variation involves the rearrangement or repetition of as few as hundreds to as many as tens of millions of DNA base pairs. Structural variations may be inherited or arise spontaneously and many cause genetic disorders and diseases. Until our commercial launch of the Saphyr system in February 2017, and since, we believe no products existed or exist that could more comprehensively and cost and time-efficiently detect structural variation.

We have established relationships with key opinion leaders in genomics research and clinical applications, including rare diseases and oncology, and our installed base of over 90 systems made up of Saphyr and its predecessor includes some of the world's most prominent clinical, translational research, basic research, academic and government institutions as well as leading pharmaceutical and diagnostic companies. Examples include Children's National Health System, DuPont Pioneer, Garvan Institute of Medical Research, Genentech, Icahn School of Medicine at Mount Sinai, McDonnell Genome Institute at Washington University, National Institutes of Health, Pennsylvania State University and Salk Institute for Biological Studies. Our revenues in 2017 were $9.5 million, representing approximately 40% growth over the prior year, and for the first half of 2018 our revenues were $5.2 million, representing approximately 32% growth over the prior year comparable period. Our cumulative revenues for the period from January 1, 2016 through June 30, 2018 from each of the customers listed above were, respectively, $0.5M, $0.5M, $0.3M, $0.3M, $0.1M, $0.4M, $0.1M, $0.3M, and $0.1M.

Approximately 6,000 research use only, or RUO, high throughput sequencers are currently installed worldwide. Sequencing is very good at detecting genome differences involving just a few base pairs or single-nucleotide variations, but sequencing, including next-generation sequencing, or NGS, cannot reliably detect the larger structural variations that our system can detect. Therefore, Saphyr is being adopted alongside this installed base of sequencers as a complement that gives users the ability to see a much wider scope of genome variation than ever before. As shown in the graphic below, the Garvan Institute of Medical Research generated data that we expect to be published which shows the density of structural variations found relative to the size of the structural variation found for our system (blue lines) against next-generation sequencing (Illumina; orange lines). Next-generation sequencing has a very significant deficiency in detecting structural variations. Given our system's ability to detect structural variations, it picks up essentially where next-generation sequencing drops off, as shown below.



The Saphyr system, which is for RUO, is also beginning to be adopted by cytogenetics labs that seek to use it in commercial clinical tests of its patients as a laboratory developed test, or LDT. These labs currently rely on existing methods such as karyotyping, fluorescence in situ hybridization, or FISH, and microarrays for clinical tests and research that look at chromosomal structure, location and function in cells. Major guidelines for oncology and genetic disease clinical diagnostics recommend first-line structural variation testing by these existing methods. The organizations issuing these guidelines include, among many others, World Health Organization (WHO), National Comprehensive Cancer Network (NCCN), American College of Medical Genetics (ACMG) and American College of Obstetricians & Gynecologists (ACOG).

We estimate that approximately 2,500 clinical cytogenetics labs exist worldwide. We believe Saphyr makes clinical testing for structural variations simpler, higher throughput, more cost effective and more scalable. In addition, we believe that Saphyr makes it easier for cytogenetics labs to accommodate new content when the research community validates newly discovered structural variation-based biomarkers for clinical diagnostics. Importantly, Saphyr can be used alone to provide comprehensive detection of structural variations and enable diagnostic calls without the need for any sequencing or cytogenetic technology.

Saphyr and its predecessor system, which we collectively refer to as our system in this prospectus, have been cited by researchers and clinicians in approximately 130 publications covering structural variations in areas of high unmet medical need and research interest, such as rare and undiagnosed pediatric diseases, muscular diseases, developmental delays and disorders, prostate cancer and leukemia.

Market Opportunity

According to Research and Markets, the worldwide market for genomics products and services is expected to reach approximately $23.9 billion by 2022, up from approximately $14.7 billion in 2017, representing a compound annual growth rate of 10.2%.

We believe that the discovery research and cytogenetics segments together comprise an addressable opportunity for us to sell up to approximately 8,500 Saphyr systems, representing a current total instrument market opportunity of approximately $2.1 billion. In addition to the instrument sales opportunity, Saphyr instruments generate recurring revenue from chip consumables that are used on a per-sample basis. We believe each Saphyr instrument has the potential to create recurring revenue in a range of approximately $75,000 to approximately $150,000 per year, suggesting a potential annual recurring revenue opportunity of approximately $0.6 billion to approximately $1.3 billion. Therefore, we believe that our currently addressable portion of the genome analysis market is estimated to be between $2.7 billion and $3.4 billion.

Existing Technologies and Their Limitations

Even though both single nucleotide variation and structural variation are each very common, a much larger number of variant nucleotides in the average human genome are found in structural variations as compared to single nucleotide variations. A recent study showed that 30 million base pairs, on average, in the human genome are part of structural variations while only 10 million are single nucleotide variations. Sequencing and cytogenetics simply do not elucidate comprehensive structural variations in a systematic and cost- and time-efficient manner. Most structural variations found to date that have been implicated in disease were discovered through laborious, expensive, unindustrialized and non-comprehensive methods over the course of many years.

The Limitations of Sequencing

Nearly all genome sequencing, including next-generation sequencing, uses a method called sequencing by synthesis. Sequencing by synthesis is an in-vitro process for synthesizing a copy of DNA, one base at a time in a way that makes it possible to measure the identity of each base as it is incorporated into the growing DNA copy. The read lengths typical for next-generation sequencing are often too short to determine the right location and orientation of a reading frame in the genome because many of the reads from one chromosome are identical to reads from either another chromosome or even another location on the same chromosome. These short lengths disconnect and destroy most of the structural information of the original genome and make next-generation sequencing unable to reliably detect genomic variations larger than a few hundred base pairs.

The recognition of the need for greater lengths of sequence reads to determine genome structure, birthed the so-called long-read sequencing submarket. Because of the need for long-read sequencing, Pacific Biosciences of California developed a system that uses another alternative form of sequencing by synthesis, while Oxford Nanopore Technologies developed a system that uses nanopore technology. These systems provide users with average read lengths in the tens of thousands of base pairs. However, these read lengths have proven not to be long enough to reliably and comprehensively detect structural variations. Pacific Biosciences' polymerases cannot regularly produce reads that are the necessary hundreds of thousands of base pairs in length. In addition, Oxford Nanopore's system has difficulty reliably feeding molecules that are, on average, hundreds of thousands of base pairs in length through each nanopore. The time and cost of providing a comprehensive whole genome analysis of a patient in a clinical setting is prohibitive when using these longer-read technologies.

The Limitations of Cytogenetics

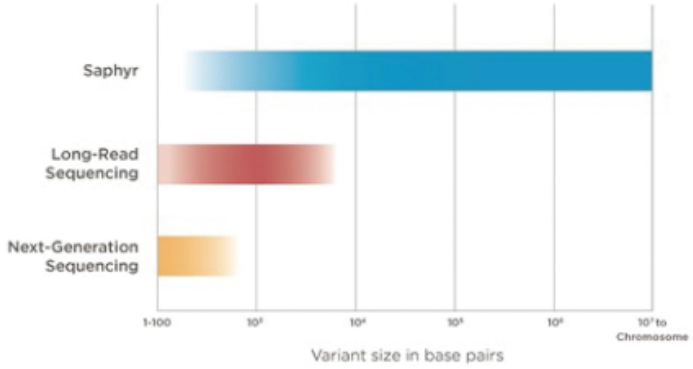
Cytogenetics is the study of chromosomal structure and how structural variations impact health. The field has historically relied on karyotyping, FISH and more recently, microarrays. These methods each can detect some structural variations, but they are all inadequate solutions for high volume and low cost genetic testing for structural variations, and none is an approach that can comprehensively detect structural variations with the ultra-high sensitivity and ultra-high specificity of the Saphyr system.

- Karyotyping is the gross optical examination of the chromosomes using a microscope. In this method, chromosomes are directly viewed on a slide by a pathologist with a microscope, resulting in resolution that is limited to structural events that are larger than five million base pairs. When karyotyping is used to diagnose unknown genetic disease, only about 5% of karyotyping tests result in a confirmed pathogenic finding. The test is costly, and its results are subject to each pathologist's interpretation which introduces variability in diagnostic calls and makes the methodology not amenable to automation.
- FISH is a molecular cytogenetic technique that is used to detect chromosomal aberrations. FISH is limited to known targets and cannot be used for discovery. Every FISH test performed needs to be chosen to look for a specific genetic marker that the clinician anticipates may be found based on the clinical symptoms of the patient. In addition, the test results can be ambiguous and inconclusive, and reproducibility and variability among users can be a significant issue. Like karyotyping, FISH's diagnostic yield is very low when used to diagnose unknown genetic disease with only an estimated 7% of FISH providing a confirmed pathogenic finding. In addition, FISH is expensive, especially for the limited amount of information that it provides.
- Chromosomal microarrays and SNP (single nucleotide polymorphism) arrays are tests consisting of slides that contain thousands of spots of DNA fragments that bind to the DNA of the sample. Microarrays have limited utility as a diagnostic tool as they are only useful when there are gains and losses of base pairs within the sample's genome that are specific to the probes that are populated on the array. Microarrays are also limited in their ability to provide specific locations of gains or losses on a chromosome, or even identify on which chromosome that the gains or losses occur. In addition, microarrays have low resolution as they cannot reliably detect structural variants smaller than 50,000 base pairs. Also, the diagnostic yield of microarrays is low. Only an estimated 20% of microarray tests provide a confirmed pathogenic finding when used to diagnose unknown genetic disease.

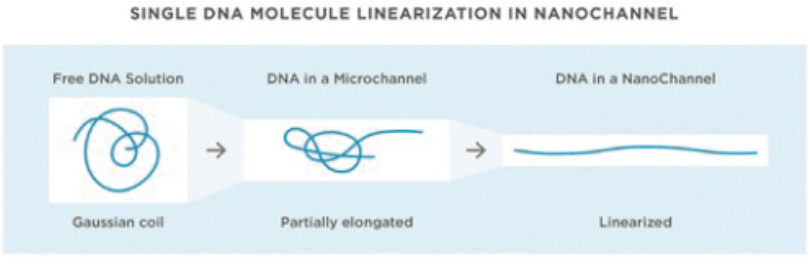
Our Solution

Our approach to measuring genome structure and structural variation is novel and highly differentiated. Our Saphyr system directly observes extremely long genomic DNA without any amplification to construct a physical map that accurately assigns the chromosomal location, order, orientation and quantity of all the genome's functional elements. Our solution is built upon four key elements:

- **Extremely long molecules for analysis.** The Saphyr system is capable of analyzing single molecules that are on average approximately 250,000 base pairs long. These lengths are over 1,000 times longer than the average read length with Illumina systems and approximately 10 times longer than the average read lengths with Pacific Biosciences and Oxford Nanopore systems. Building a picture of the genome with massive building blocks overcomes the inherent challenge of genome complexity and is the key to Saphyr's unprecedented sensitivity and specificity.



- **Proprietary nanotechnology for massively parallel linearization and analysis of long molecules with single molecule imaging.** Analyzing these extremely long chromosomal fragments required invention. Molecules of this size are more like balls of yarn in a test tube and must be unraveled for meaningful analysis. We invented, patented, developed and commercialized nanochannel arrays to capture them from solution and unwind and linearize them for structural variation analysis. Each molecule is imaged separately, making it possible to deconvolute complex mixtures including haplotypes and heterogeneous tumors, as shown in the graphic below.



- **DNA labeling chemistry specifically for physical mapping.** The detailed analysis of sequence we use is also highly unique and novel. Instead of identifying the sequence of every base pair in these long fragments, we label and detect specific sequence patterns or motifs that occur universally across every genome with an average frequency of approximately one site for every few thousand base pairs.
- **Bioinformatic tools for structural variation analysis.** Finally, our approach includes a novel bioinformatics platform that we developed from the ground-up to take advantage of the unique benefits of our solution. It comprises proprietary algorithms for the construction of a structurally accurate physical map of the genome without using a reference genome in assignment of structure. Physical maps of a test subject are then compared in cross-mapping analysis that allows our system to detect genome wide structural variation, including the most complex balanced events.

Our Focus Areas

Our Saphyr system serves many segments of the genomics market seeking to find and understand structural variation. We have identified focus areas where we concentrate our resources to ensure robust adoption of our system and frequent utilization of consumables. We have selected these segments because of their urgent need to detect structural variations and the significant economic opportunity they represent. Our current focus areas are human genetic diseases, including rare diseases and oncology.

- **Rare diseases.** In genetic disease, existing tools have reached a plateau where almost half of patients with genetic disease who are tested in clinical laboratories fail to receive a molecular diagnosis. In order to increase diagnostic yield, a massive increase in the understanding of the complete structure and variation of the genome is essential.
- **Cancer.** In cancer, each patient has a unique disease with a complex pattern of genome changes. Traditional and recently-developed treatments do not attack the individual changes in each patient's tumor. Recent personalized medicine programs aim to provide clinicians with individual treatments specifically targeting the mutations found in each patient's cancer. For personalized cancer medicine to be successful, all variants in the cancer genome need to be detected, which is not feasible with cytogenetic or whole genome sequencing approaches.

Our Saphyr system, which is for RUO, is being used for basic and translational research and also beginning to be adopted by cytogenetics labs that seek to use it in commercial clinical tests of its patients as an LDT.

Our Strengths

We have established ourselves as one of the leaders in the field of genome analysis, and we believe we are the industry's performance leader in structural variation detection. Below are our strengths that we believe will enable us to capture a significant portion of the genome analysis market and retain our leadership position in structural variation:

- ***Highly differentiated technology platform enables researchers and clinicians to obtain information that cannot be had systematically and cost efficiently from traditional technologies.*** Saphyr's unique ability to systematically and cost efficiently see structural variations across the genome from 500 base pairs to tens of millions of base pairs is unique in the industry. We believe this greater insight will facilitate a paradigm shift in healthcare from an emphasis on treatment with relatively untargeted therapies to a focus on earlier detection, more precise diagnosis and treatment with better targeted therapies.
- ***Validated solution recognized industry-wide.*** We have deep and expanding scientific validation as evidenced by the quickly expanding base of publications regarding our system. We believe our technology is becoming a vital tool in cutting-edge life sciences research.

- ***Strong installed base of premier customers.*** We have sold more than 90 of our systems to over 80 customers globally, including some of the world's most prominent clinical, translational research, basic research, academic and government institutions as well as leading pharmaceutical and diagnostic companies.
- ***Attractive business model with a growing, high-margin recurring revenue component.*** As we continue to grow our installed base of Saphyr systems, optimize workflows and expand our structural variation detection capabilities, we expect to rapidly increase our high-margin revenues derived from consumables.
- ***Industry-leading intellectual property portfolio.*** We have developed a global patent portfolio that includes 43 issued patents across 14 patent families and an exclusively licensed portfolio of patents and applications from Princeton University, which includes 22 patents across two families. This global patent portfolio has filing dates ranging from 2001 to 2017.
- ***Highly experienced senior management team.*** We are led by a dedicated and highly experienced senior management team with significant industry experience and proven ability to develop novel solutions. Each of the members of our senior management has more than 20 years of relevant experience.

Our Strategy

Our goal is to enable new research in genomics to allow greater insight into their role in human health in ways that have not been possible with any other current research and diagnostic technologies.

Our strategy to achieve this includes:

- drive adoption of Saphyr in discovery research and cytogenetics markets;
- support the publication of findings with Saphyr by our customers and partners;
- expand gross margins through economies of scale and growing sales of consumables;
- continue to innovate our products and technologies; and
- partner with industry-leading companies and laboratories to accelerate adoption in clinical markets.

Risk Factors Summary

Investing in our securities involves substantial risk. The risks described under the heading "Risk Factors" immediately following this summary may cause us to not realize the full benefits of our strengths or may cause us to be unable to successfully execute all or part of our strategy. Some of the more significant challenges include the following:

- we have incurred losses since we were formed and expect to incur losses in the future. We cannot be certain that we will achieve or sustain profitability;
- our quarterly and annual operating results and cash flows have fluctuated in the past and might continue to fluctuate, which could cause the market price of our securities to decline substantially;
- we are an early, commercial-stage company and have a limited operating history, which may make it difficult to evaluate our current business and predict our future performance;
- if we are unable to maintain adequate revenue growth or do not successfully manage such growth, our business and growth prospects will be harmed;

- our future capital needs are uncertain and we may need to raise additional funds in the future;
- if our products fail to achieve and sustain sufficient market acceptance, our revenue will be adversely affected;
- our future success is dependent upon our ability to further penetrate our existing customer base and attract new customers;
- we are currently limited to "research use only" with respect to many of the materials and components used in our consumable products including our assays;
- in the near term, our business will depend on levels of research and development spending by academic and governmental research institutions and biopharmaceutical companies, a reduction in which could limit demand for our products and adversely affect our business and operating results;
- if we do not successfully manage the development and launch of new products, our financial results could be adversely affected;
- if the U.S. Food and Drug Administration determines that our products are medical devices or if we seek to market our products for clinical diagnostic or health screening use, we will be required to obtain regulatory clearance(s) or approval(s), and may be required to cease or limit sales of our then marketed products, which could materially and adversely affect our business, financial condition and results of operations. Any such regulatory process would be expensive, time-consuming and uncertain both in timing and in outcome;
- if we are unable to protect our intellectual property, it may reduce our ability to maintain any technological or competitive advantage over our competitors and potential competitors, and our business may be harmed; and
- our principal stockholders and management own a significant percentage of our stock and will be able to exert significant control over matters subject to stockholder approval.

Corporate Information

We were formed in January 2003 as BioNanomatrix LLC, a Delaware limited liability company. In August 2007, we became BioNanomatrix Inc., a Delaware corporation. In October 2011, we changed our name to BioNano Genomics, Inc., and in July 2018, we changed our name to Bionano Genomics, Inc.

Our principal executive offices are located at 9640 Towne Centre Drive, Suite 100, San Diego, California 92121, and our telephone number is (858) 888-7600. Our website address is www.bionanogenomics.com. Information contained in, 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. Our design logo, "Bionano," and our other registered and common law trade names, trademarks and service marks are the property of Bionano Genomics, Inc.

We are an "emerging growth company" as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act. We may take advantage of certain exemptions from various public company reporting requirements, including not being required to have our internal control over financial reporting audited by our independent registered public accounting firm under Section 404 of the Sarbanes-Oxley Act of 2002, reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements, and exemptions from the requirements of holding a nonbinding advisory vote on executive compensation and any golden parachute payments. We may take advantage of these exemptions for up to five years or until we are no

longer an “emerging growth company,” whichever is earlier. In particular, in this prospectus, we have provided only two years of audited financial statements and have not included all of the executive compensation related information that would be required if we were not an emerging growth company. Accordingly, the information contained herein may be different than the information you receive from other public companies in which you hold stock.

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 new or revised accounting standards that have different transition dates for public and private companies until those standards would otherwise apply to private companies. We have elected to use this extended transition period. As a result of this election, our timeline to comply with these standards will in many cases be delayed as compared to other public companies that are not eligible to take advantage of this election or have not made this election. Therefore, our financial statements may not be comparable to those of companies that comply with the public company effective dates for these standards.

The Offering

Securities offered by us	2,450,000 units, each consisting of one share of common stock and one warrant to purchase one share of common stock. Each warrant to purchase common stock contained in a unit entitles the holder to purchase one share of our common stock at an initial exercise price of $ per share (100% of the offering price per unit), subject to adjustment. Each such warrant will become exercisable 30 days after the date of this prospectus or on such date the underwriters separate the units, whichever date is earlier, and will expire five years from the date of this prospectus.
Common stock to be outstanding after this offering	8,396,637 shares (including shares included in the units but excluding shares underlying the warrants included in the units)
Option to purchase additional units offered by us	367,500 units
Use of proceeds	We estimate that our net proceeds from this offering will be $13.0 million (or approximately $15.2 million if the underwriters' option to purchase additional units from us is exercised in full), after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. We intend to use the net proceeds we receive from this offering to expand our commercial capabilities in selling and marketing related to our products, to fund our ongoing research and development activities, and for general corporate purposes, including working capital, operating expenses and capital expenditures. See "Use of Proceeds" for additional information.
Risk factors	You should carefully read and consider the information in the section titled "Risk Factors" and all other information set forth in this prospectus before deciding to purchase any units.
Proposed Nasdaq trading symbols	Our common stock has been approved for listing on The Nasdaq Stock Market LLC under the symbol "BNGO" and we have applied for the listing on The Nasdaq Stock Market LLC of the units and the warrants under the symbols "BNGOU" and "BNGOW," respectively.

The number of shares of our common stock to be outstanding after this offering is based on 2,928,325 shares of our common stock as of June 30, 2018, after giving effect to the conversion of shares of our convertible preferred stock outstanding as of June 30, 2018 into an aggregate of 2,850,280 shares of our common stock immediately prior to the closing of this offering, and excludes:

- 416,937 shares of our common stock issuable upon the exercise of stock options outstanding as of June 30, 2018 under our Amended and Restated 2006 Equity Compensation Plan, as amended, or 2006 Plan, with a weighted-average exercise price of $5.05 per share;
- 1,499,454 shares of our common stock reserved for future issuance under our 2018 Equity Incentive Plan, or 2018 Plan, which will become effective once the registration statement of which this prospectus forms a part is declared effective, with such shares including 1,000,000 new shares plus the number of shares (not to exceed 499,454 shares) (i) that remain available for the issuance of awards under our 2006 Plan at the time our 2018 Plan becomes effective, and (ii) any shares underlying outstanding stock awards granted under our 2006 Plan that expire or are repurchased, forfeited,

cancelled or withheld, as more fully described in the section titled “Executive Compensation – Equity Incentive Plans”;

- 175,000 shares of our common stock reserved for issuance under our 2018 Employee Stock Purchase Plan, or ESPP, which will become effective once the registration statement of which this prospectus forms a part is declared effective, and any automatic increases in the number of shares of common stock reserved for future issuance under our ESPP;
- 1,001 shares of our common stock issuable upon the exercise of an outstanding warrant which, prior to the completion of this offering, is exercisable for 42,872 shares of our Series B convertible preferred stock;
- 1,752 shares of our common stock issuable upon the exercise of outstanding warrants which, prior to the completion of this offering, are exercisable for 75,027 shares of our Series B-1 convertible preferred stock;
- 11,925 shares of our common stock issuable upon the exercise of an outstanding warrant which, prior to the completion of this offering, is exercisable for 510,417 shares of our Series D convertible preferred stock;
- 21,416 shares of our common stock issuable upon the exercise of outstanding warrants which, prior to the completion of this offering, are exercisable for 916,667 shares of our Series D-1 convertible preferred stock; and
- up to 84,525 shares of common stock issuable upon exercise of warrants to be issued to the Underwriters in connection with this offering, which will have an exercise price per share equal to 150% of the initial public offering price per unit in this offering.

Unless we specifically state otherwise, the information in this prospectus assumes or gives effect to:

- the filing of our amended and restated certificate of incorporation, which will be in effect upon the completion of this offering;
- the conversion of all of our outstanding shares of convertible preferred stock into an aggregate of 2,850,280 shares of common stock upon the closing of this offering;
- the conversion of outstanding convertible promissory notes and a conversion date of June 30, 2018 into 3,018,312 shares of common stock (based on an assumed initial public offering price of $6.50 per unit (the midpoint of the price range set forth on the cover page of this prospectus) and a conversion date of June 30, 2018);
- that the initial public offering price of our units is $6.50 per unit, which is the midpoint of the price range set forth on the cover page of this prospectus;
- no exercise of the outstanding options described above;
- no exercise of the underwriters’ option to purchase up to an additional 367,500 units from us in this offering; and
- a 1-for-21.4 reverse stock split of our common stock effected on July 16, 2018 and a subsequent 1-for-2 reverse stock split of our common stock effected on August 15, 2018.

Certain of our existing stockholders, including entities affiliated with them or with certain of our directors, have indicated an interest in purchasing an aggregate of approximately $8.0 million in units in this offering at the initial public offering price per unit. However, because indications of interest are not binding agreements or commitments to purchase, the underwriters may determine to sell more, less or no units in this offering to any of these persons or entities, or any of these persons or entities may determine to purchase more, less or no units in this offering. The underwriters will receive the same underwriting discount on any units purchased by these persons or entities as they will on any other units sold to the public in this offering.

Summary Financial Data

The summary statement of operations data for the years ended December 31, 2016 and 2017 and the balance sheet data as of December 31, 2017 are derived from our audited financial statements that are included elsewhere in this prospectus. The summary statement of operations data for the six months ended June 30, 2017 and 2018 and the balance sheet data as of June 30, 2018 are derived from our unaudited financial statements that are included elsewhere in this prospectus. Our historical results are not necessarily indicative of our results in any future period and results from our interim period may not necessarily be indicative of the results of the entire year.

You should read the following summary financial data together with "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our financial statements and the related notes included elsewhere in this prospectus. The summary financial data in this section are not intended to replace our financial statements and the related notes and are qualified in their entirety by the financial statements and related notes included elsewhere in this prospectus.

	Year ended December 31,		Six Months Ended June 30,	
	2016	2017	2017	2018
			(unaudited)	
Total revenue	$ 6,792,789	$ 9,505,043	$ 3,916,864	$ 5,158,494
Operating expenses				
Cost of revenue	3,578,692	6,030,512	2,844,117	2,654,879
Research and development	11,431,941	12,009,170	6,584,614	4,465,919
Selling, general and administrative	12,950,572	14,079,658	7,436,426	6,385,378
Impairment of property and equipment	—	604,511	—	—
Total operating expenses	27,961,205	32,723,851	16,865,157	13,506,176
Interest expense	(470,072)	(590,927)	(286,095)	(709,616)
Other income	2,802,797	462,923	896,758	1,907,742
Provision for income taxes	(12,924)	(18,552)	(22,358)	(9,282)
Net loss	$ (18,848,615)	$ (23,365,364)	$ (12,359,988)	$ (7,158,838)
Net loss per share[1]:				
Basic and diluted	$ (312.46)	$ (327.78)	$ (176.12)	$ (92.23)
Pro forma net loss per share[1]:				
Basic and diluted		$ (8.65)		$ (1.40)

(1) See Note 2 to our financial statements included elsewhere in this prospectus for a description of how we compute basic and diluted net income per share attributable to common stockholders and preferred stockholders and pro forma basic and diluted net loss per share attributable to common stockholders.

	As of June 30, 2018		
	Actual	Pro Forma(1)	Pro Forma As Adjusted(2)(3)
		(unaudited)	
Balance Sheet Data:			
Cash and cash equivalents	$ 7,624,289	$ 7,624,289	$ 20,619,039
Working capital(4)	(6,773,417)	9,161,262	22,156,012
Total assets	18,094,156	18,094,156	31,088,906
Convertible note	14,329,843	—	—
Long-term debt	8,956,143	8,956,143	8,956,143
Total liabilities	32,361,630	16,426,951	16,426,951
Convertible preferred stock	43,010,137	—	—
Accumulated deficit	(61,424,874)	(61,424,874)	(61,424,874)
Total stockholders' (deficit) equity	(57,277,611)	1,667,205	14,661,955

(1) The pro forma balance sheet data gives effect to (i) the automatic conversion of all of our outstanding shares of convertible preferred stock into an aggregate of 2,850,280 shares of common stock, and (ii) the conversion of approximately $14.4 million aggregate principal amount of outstanding convertible promissory notes plus accrued interest thereon into 3,018,312 shares of common stock (based on an assumed initial public offering price of $6.50 per unit (the midpoint of the price range set forth on the cover page of this prospectus) and a conversion date of June 30, 2018).

(2) The pro forma as adjusted balance sheet data reflects (i) the items described in footnote (1) above and (ii) our receipt of estimated net proceeds from the sale of 2,450,000 units at the assumed initial public offering price of $6.50 per unit, after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us.

(3) A $1.00 increase (decrease) in the assumed initial public offering price of $6.50 per unit would increase (decrease) cash and cash equivalents, working capital, total assets, total liabilities, additional paid-in capital and total stockholders' (deficit) equity by $2.3 million, assuming that the number of units offered by us, as set forth on the cover page of this prospectus, remains the same, after deducting the estimated underwriting discounts and commissions. Similarly, each increase (decrease) of 1.0 million units offered by us would increase (decrease) each of cash and cash equivalents, working capital, total assets, additional paid-in capital and total stockholders' (deficit) equity by $6.0 million, assuming the assumed initial public offering price of $6.50 per unit remains the same, and after deducting the estimated underwriting discounts and commissions.

(4) Working capital is calculated as current assets minus current liabilities.

RISK FACTORS

Investing in our securities 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 financial statements and related notes appearing at the end of this prospectus, before making an investment decision. The risks described below are not the only ones facing us. 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 securities 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 financial condition and need for additional capital

We have incurred losses since we were formed and expect to incur losses in the future. We cannot be certain that we will achieve or sustain profitability.

We incurred net losses of $18.8 million and $23.4 million for the years ended December 31, 2016 and 2017, respectively. We incurred net losses of $12.4 million and $7.2 million for the six months ended June 30, 2017 and 2018, respectively. As of June 30, 2018, we had an accumulated deficit of $61.4 million. We cannot predict if we will achieve sustained profitability in the near future or at all. We expect that our losses will continue for the foreseeable future as we plan to invest significant additional funds toward expansion of our commercial organization and the development of our technology. In addition, as a public company, we will incur significant legal, accounting, and other expenses that we did not incur as a private company. These increased expenses will make it harder for us to achieve and sustain future profitability. We may incur significant losses in the future for a number of reasons, many of which are beyond our control, including the other risks described in this prospectus, the market acceptance of our products, future product development and our market penetration and margins.

Our quarterly and annual operating results and cash flows have fluctuated in the past and might continue to fluctuate, which could cause the market price of our securities to decline substantially.

Numerous factors, many of which are outside our control, may cause or contribute to significant fluctuations in our quarterly and annual operating results. These fluctuations may make financial planning and forecasting uncertain. In addition, these fluctuations may result in unanticipated decreases in our available cash, which could negatively affect our business and prospects. In addition, one or more of such factors may cause our revenue or operating expenses in one period to be disproportionately higher or lower relative to the others. As a result, comparing our operating results on a period-to-period basis might not be meaningful. You should not rely on our past results as indicative of our future performance. Moreover, our stock price might be based on expectations of future performance that are unrealistic or that we might not meet and, if our revenue or operating results fall below the expectations of investors or securities analysts, the price of our securities could decline substantially.

Our operating results have varied in the past. In addition to other risk factors listed in this section, some of the important factors that may cause fluctuations in our quarterly and annual operating results include:

- adoption of our systems and related products;
- the timing of customer orders to purchase our systems;
- the rate of utilization of consumables by our customers;
- receipt and timing of revenue for services provided by out data solutions service;

- the timing of the introduction of new systems, products, system and product enhancements and services; and
- the receipt and timing of revenue from our distribution and marketing arrangements.

In addition, a significant portion of our operating expense is relatively fixed in nature, and planned expenditures are based in part on expectations regarding future revenue. Accordingly, unexpected revenue shortfalls could decrease our gross margins and cause significant changes in our operating results from quarter to quarter. If this occurs, the trading price of our securities could fall substantially.

We are an early, commercial-stage company and have a limited operating history, which may make it difficult to evaluate our current business and predict our future performance.

We are an early, commercial-stage company and have a limited commercial history. Our limited commercial history may make it difficult to evaluate our current business and makes predictions about our future success or viability subject to significant uncertainty. We will continue to encounter risks and difficulties frequently experienced by early, commercial-stage companies, including scaling up our infrastructure and headcount. If we do not address these risks successfully, our business will suffer.

If we are unable to maintain adequate revenue growth or do not successfully manage such growth, our business and growth prospects will be harmed.

We have experienced significant revenue growth in a short period of time. We may not achieve similar growth rates in future periods. Investors should not rely on our operating results for any prior periods as an indication of our future operating performance. To effectively manage our anticipated future growth, we must continue to maintain and enhance our financial, accounting, manufacturing, customer support and sales administration systems, processes and controls. Failure to effectively manage our anticipated growth could lead us to over-invest or under-invest in development, operational and administrative infrastructure; result in weaknesses in our infrastructure, systems, or controls; give rise to operational mistakes, losses, loss of customers, productivity or business opportunities; and result in loss of employees and reduced productivity of remaining employees.

Our continued growth could require significant capital expenditures and might divert financial resources from other projects such as the development of new products and services. As additional products are commercialized, we may need to incorporate new equipment, implement new technology systems, or hire new personnel with different qualifications. Failure to manage this growth or transition could result in turnaround time delays, higher product costs, declining product quality, deteriorating customer service, and slower responses to competitive challenges. A failure in any one of these areas could make it difficult for us to meet market expectations for our products, and could damage our reputation and the prospects for our business.

If our management is unable to effectively manage our anticipated growth, our expenses may increase more than expected, our revenue could decline or grow more slowly than expected and we may be unable to implement our business strategy. The quality of our products and services may suffer, which could negatively affect our reputation and harm our ability to retain and attract customers.

Our future capital needs are uncertain and we may need to raise additional funds in the future.

We believe that the net proceeds from this offering, together with our cash generated from commercial sales and our existing cash and cash equivalents, including the proceeds from our recent financings, will enable us to fund our operating expenses and capital expenditure requirements for at least the next 18 months. However, we may need to raise substantial additional capital to:

- expand our sales and marketing efforts to further commercialize our products;

- expand our research and development efforts to improve our existing products and develop and launch new products, particularly if any of our products are deemed by the U.S. Food and Drug Administration, or FDA, to be medical devices or otherwise subject to additional regulation by the FDA;
- seek FDA approval to market our existing products or new products utilized for diagnostic purposes;
- lease a larger facility or build out our existing facility as we continue to grow our employee headcount;
- hire additional personnel;
- enter into collaboration arrangements, if any, or in-license other products and technologies;
- add operational, financial and management information systems; and
- incur increased costs as a result of operating as a public company.

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

- market acceptance of our products;
- the cost and timing of establishing additional sales, marketing and distribution capabilities;
- the cost of our research and development activities;
- the success of our existing distribution and marketing arrangements and our ability to enter into additional arrangements in the future; and
- the effect of competing technological and market developments.

We cannot assure you that we will be able to obtain additional funds on acceptable terms, or at all. If we raise additional funds by issuing equity or equity-linked securities, our stockholders may experience dilution. Future debt financing, if available, may involve covenants restricting our operations or our ability to incur additional debt. Any debt or equity financing may contain terms that are not favorable to us or our stockholders. If we raise additional funds through collaboration and licensing arrangements with third parties, it may be necessary to relinquish some rights to our technologies or our products, or grant licenses on terms that are not favorable to us. If we do not have, or are not able to obtain, sufficient funds, we may have to delay development or commercialization of our products. We also may have to reduce marketing, customer support or other resources devoted to our products or cease operations. Any of these factors could have a material adverse effect on our financial condition, operating results and business.

The recently passed comprehensive tax reform bill could adversely affect our business and financial condition.

On December 22, 2017, President Trump signed into law new legislation that significantly revises the Internal Revenue Code of 1986, as amended. The newly enacted federal income tax law, among other things, contains 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 earnings (except for certain small businesses), limitation of the deduction for net operating losses 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 (including reducing the business tax credit for certain clinical testing expenses incurred in the testing of certain drugs for rare diseases or conditions). Notwithstanding the reduction in the corporate income tax rate, the overall impact of the new federal tax law is uncertain, and our business and financial condition could be adversely affected. In addition, it is unknown if and to what extent various states will conform to the newly enacted federal tax law. The impact of this tax reform on holders of our securities is likewise 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 securities.

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

As of June 30, 2018, we had aggregate U.S. net operating loss carryforwards of approximately $30.5 million and aggregate U.S. research and development credits of approximately $4.1 million. These net operating loss carryforwards could expire unused and be unavailable to offset future income tax liabilities. Under the newly enacted federal income tax law, federal net operating losses incurred in 2018 and in future years may be carried forward indefinitely, but the deductibility of such federal net operating losses is limited. It is uncertain if and to what extent various states will conform to the newly enacted federal tax law. In addition, under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended, 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 to offset its post-change income or taxes may be limited. We have experienced an ownership change in the past and we may also experience additional 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.

U.S. taxation of international business activities or the adoption of tax reform policies could materially impact our future financial position and results of operations.

Limitations on the ability of taxpayers to claim and utilize foreign tax credits and the deferral of certain tax deductions until earnings outside of the U.S. are repatriated to the U.S., as well as changes to U.S. tax laws that may be enacted in the future, could impact the tax treatment of future foreign earnings. Should the scale of our international business activities expand, any changes in the U.S. taxation of such activities could increase our worldwide effective tax rate and harm our future financial position and results of operations.

The terms of our credit facility place restrictions on our operating and financial flexibility, and failure to comply with covenants or to satisfy certain conditions of the agreement governing the credit facility may result in acceleration of our repayment obligations and foreclosure on our pledged assets, which could significantly harm our liquidity, financial condition, operating results, business and prospects and cause the price of our securities to decline.

In June 2018, we entered into a credit and security agreement with Midcap Financial Trust, or Midcap, that is secured by a lien covering substantially all of our assets, including intellectual property. The credit and security agreement provides for a five year $15 million term loan facility, of which we drew $10 million at closing. The remaining $5 million may be drawn upon satisfaction of certain conditions. The loan and security agreement governing the credit facility requires us to comply with a number of covenants (affirmative and negative), including restrictive covenants that limit our ability to: incur additional indebtedness; encumber the collateral securing the loan; acquire, own or make investments; repurchase or redeem any class of stock or other equity interest; declare or pay any cash dividend or make a cash distribution on any class of stock or other equity interest; transfer a material portion of our assets; acquire other businesses; and merge or consolidate with or into any other organization or otherwise suffer a change in control, in each case subject to exceptions. Our intellectual property is also subject to customary negative covenants. In addition, subject to limited exceptions, Midcap could declare an event of default upon the occurrence of any event that it interprets as having a material adverse effect upon our business, operations, properties, assets, or financial condition or upon our ability to perform or pay the secured obligations under the loan and security agreement or upon the collateral or Midcap's liens on the collateral under the agreement, thereby requiring us to repay the loan immediately, together with a prepayment charge of up to 4% of the then outstanding principal balance, together with other fees.

If we default under the credit facility, Midcap may accelerate all of our repayment obligations and, if we are unable to access funds to meet those obligations or to renegotiate our agreement, Midcap could take control of our pledged assets and we could immediately cease operations. If we were to renegotiate our agreement under

such circumstances, the terms may be significantly less favorable to us. If we were liquidated, Midcap's right to repayment would be senior to the rights of our stockholders to receive any proceeds from the liquidation. Any declaration by Midcap of an event of default could significantly harm our liquidity, financial condition, operating results, business, and prospects and cause the price of our securities to decline.

We may incur additional indebtedness in the future. The debt instruments governing such indebtedness may contain provisions that are as, or more, restrictive than the provisions governing our existing indebtedness under the credit and security agreement with Midcap. If we are unable to repay, refinance or restructure our indebtedness when payment is due, the lenders could proceed against the collateral or force us into bankruptcy or liquidation.

Risks related to our business

If our products fail to achieve and sustain sufficient market acceptance, our revenue will be adversely affected.

Our success depends on our ability to develop and market products that are recognized and accepted as reliable, enabling and cost-effective. Most of the potential customers for our products already use expensive research systems in their laboratories that they have used for many years and may be reluctant to replace those systems with ours. Market acceptance of our systems will depend on many factors, including our ability to convince potential customers that our technology is an attractive alternative to existing technologies. Compared to some competing technologies, our technology is new and complex, and many potential customers have limited knowledge of, or experience with, our products. Prior to adopting our systems, some potential customers may need to devote time and effort to testing and validating our systems. Any failure of our systems to meet these customer benchmarks could result in potential customers choosing to retain their existing systems or to purchase systems other than ours. In addition, it is important that our gene mapping systems be perceived as accurate and reliable by the scientific and medical research community as a whole. Historically, a significant part of our sales and marketing efforts has been directed at demonstrating the advantages of our technology to industry leaders and encouraging such leaders to publish or present the results of their evaluation of our system. If we are unable to continue to motivate leading researchers to use our technology, or if such researchers are unable to achieve or unwilling to publish or present significant experimental results using our systems, acceptance and adoption of our systems will be slowed and our ability to increase our revenue would be adversely affected.

Our future success is dependent upon our ability to further penetrate our existing customer base and attract new customers.

Our current customer base is primarily composed of academic and governmental research institutions, as well as biopharmaceutical and contract research companies. Our success will depend upon our ability to respond to the evolving needs of, and increase our market share among, existing customers and additional potential customers, marketing new products as we develop them. Identifying, engaging and marketing to customers who are unfamiliar with our current products requires substantial time, expertise and expense and involves a number of risks, including:

- our ability to attract, retain and manage the sales, marketing and service personnel necessary to expand market acceptance for our technology;
- the time and cost of maintaining and growing a specialized sales, marketing and service force; and
- our sales, marketing and service force may be unable to execute successful commercial activities.

We have utilized third parties to assist with sales, distribution and customer support in certain regions of the world. There is no guarantee, when we enter into such arrangements, that we will be successful in attracting desirable sales and distribution partners. There is also no guarantee that we will be able to enter into such arrangements on favorable terms. Any failure of our sales and marketing efforts, or those of any third-party sales and distribution partners, would adversely affect our business.

We are currently limited to "research use only" with respect to many of the materials and components used in our consumable products including our assays.

Our instruments, consumable products and assays are purchased from suppliers with a restriction that they be used for research use only, or RUO. While we have focused initially on the life sciences research market and RUO products only, part of our business strategy is to expand our product line to encompass products that are intended to be used for the diagnosis of disease and precision healthcare, either alone or in collaboration with third parties. The use of our products for any such diagnostic purposes would require that we obtain regulatory clearance or approval to market our products for those purposes and also that we acquire the materials and components used in such products from suppliers without an RUO restriction. There can be no assurance that we will be able to acquire these materials and components for use in diagnostic products on acceptable terms, if at all. If we are unable to do so, we would not be able to expand our product offerings beyond RUO, and our business and prospects would suffer.

The FDA Guidance on "Distribution of In Vitro Diagnostic Products Labeled for Research Use Only or Investigational Use Only", or, the RUO/IUO Labeling Guidance, emphasizes that the FDA will review the totality of the circumstances when evaluating whether equipment and testing components are properly labeled as RUO. It further states that merely including a labeling statement that a product is intended for research use only will not necessarily render the device exempt from the FDA's 510(k) clearance, PMA, or other requirements, if the circumstances surrounding the distribution of the product indicate that the manufacturer intends for its product to be offered for clinical diagnostic use. These circumstances may include written or verbal marketing claims or links to articles regarding a product's performance in clinical applications, a manufacturer's provision of technical support for clinical validation or clinical applications, or solicitation of business from clinical laboratories, all of which could be considered evidence of intended uses that conflict with RUO labeling. If the FDA were to determine that our RUO products were intended for use in clinical investigation, diagnosis or treatment decisions, or that express or implied clinical or diagnostic claims were made for our RUO products, those products could be considered misbranded or adulterated under the Federal Food, Drug, and Cosmetic Act. If the FDA determines that our RUO products are being marketed for clinical diagnostic use without the required PMA or 510(k) clearance, we may be required to cease marketing our products as planned, recall the products from customers, revise our marketing plans, and/or suspend or delay the commercialization of our products until we obtain the required authorization. We also may be subject to a range of enforcement actions by the FDA, including warning or untitled letters, injunctions, civil monetary penalties, criminal prosecution, and recall and/or seizure of products, as well as significant adverse publicity.

If, in the future, we choose to commercialize our products for clinical diagnostic use, we will be required to comply with the FDA's premarket review and post-market control requirements for IVDs, as may be applicable. Complying with the FDA's PMA and/or 510(k) clearance requirements may be expensive, time-consuming, and subject us to significant and/or unanticipated delays. Our efforts may never result in an approved PMA or 510(k) clearance for our products. Even if we obtain a PMA or 510(k) clearance, where required, such authorization may not be for the use or uses we believe are commercially attractive and/or are critical to the commercial success of our products. As a result, being subject to the FDA's premarket review and/or post-market control requirements for our products could materially and adversely affect our business, financial condition and results of operations.

In the near term, our business will depend on levels of research and development spending by academic and governmental research institutions and biopharmaceutical companies, a reduction in which could limit demand for our products and adversely affect our business and operating results.

In the near term, we expect that our revenue will be derived primarily from sales of our instruments and consumables to academic and governmental research institutions, as well as biopharmaceutical and contract research companies worldwide for research applications. The demand for our products will depend in part upon the research and development budgets of these customers, which are impacted by factors beyond our control, such as:

- changes in government programs that provide funding to research institutions and companies;
- macroeconomic conditions and the political climate;
- changes in the regulatory environment;
- differences in budgetary cycles; and
- market acceptance of relatively new technologies, such as ours.

For example, in March 2017, the federal government announced the intent to cut federal biomedical research funding by as much as 18%. While there has been significant opposition to these funding cuts, the uncertainty regarding the availability of research funding for potential customers may adversely affect our operating results. Our operating results may fluctuate substantially due to reductions and delays in research and development expenditures by these customers. Any decrease in customers' budgets or expenditures, or in the size, scope or frequency of capital or operating expenditures, could materially and adversely affect our business, operating results and financial condition.

The sales cycle for our systems can be lengthy and variable, which makes it difficult for us to forecast revenue and other operating results.

The sales process for our systems generally involves numerous interactions with multiple individuals within an organization, and often includes in-depth analysis by potential customers of our technology and products and a lengthy review process. Our customers' evaluation processes often involve a number of factors, many of which are beyond our control. As a result of these factors, the capital investment required to purchase our systems and the budget cycles of our customers, the time from initial contact with a customer to our receipt of a purchase order can vary significantly. Given the length and uncertainty of our sales cycle, we have in the past experienced, and expect to in the future experience, fluctuations in our sales on a period-to-period basis. In addition, any failure to meet customer expectations could result in customers choosing to retain their existing systems, use existing assays not requiring capital equipment or purchase systems other than ours.

Our long-term results depend upon our ability to improve existing products and introduce and market new products successfully.

Our business is dependent on the continued improvement of our existing products and our development of new products utilizing our current or other potential future technology. As we introduce new products or refine, improve or upgrade versions of existing products, we cannot predict the level of market acceptance or the amount of market share these products will achieve, if any. We cannot assure you that we will not experience material delays in the introduction of new products in the future. For example, the introduction of our Saphyr system replaced our Irys system, and as a result we may never sell the remaining Irys units currently in our inventory. Therefore, we may from time to time determine it necessary to write down or write off units of our Irys inventory.

Consistent with our strategy of offering new products and product refinements, we expect to continue to use a substantial amount of capital for product development and refinement. We may need additional capital for product development and refinement than is available on terms favorable to us, if at all, which could adversely affect our business, financial condition or results of operations.

We generally sell our products in industries that are characterized by rapid technological changes, frequent new product introductions and changing industry standards. If we do not develop new products and product enhancements based on technological innovation on a timely basis, our products may become obsolete over time and our revenues, cash flow, profitability and competitive position will suffer. Our success will depend on several factors, including our ability to:

- correctly identify customer needs and preferences and predict future needs and preferences;
- allocate our research and development funding to products with higher growth prospects;
- anticipate and respond to our competitors' development of new products and technological innovations;
- innovate and develop new technologies and applications, and acquire or obtain rights to third-party technologies that may have valuable applications in the markets we serve;
- successfully commercialize new technologies in a timely manner, price them competitively and manufacture and deliver sufficient volumes of new products of appropriate quality on time; and
- convince customers to adopt new technologies.

In addition, if we fail to accurately predict future customer needs and preferences or fail to produce viable technologies, we may invest heavily in research and development of products that do not lead to significant revenue. Even if we successfully innovate and develop new products and product enhancements, we may incur substantial costs in doing so, and our profitability may suffer.

Our ability to develop new products based on innovation can affect our competitive position and often requires the investment of significant resources. Difficulties or delays in research, development or production of new products and services or failure to gain market acceptance of new products and technologies may reduce future revenues and adversely affect our competitive position.

If we do not successfully manage the development and launch of new products, our financial results could be adversely affected.

We face risks associated with launching new products. If we encounter development or manufacturing challenges or discover errors during our product development cycle, the product launch dates of new products may be delayed. The expenses or losses associated with unsuccessful product development or launch activities or lack of market acceptance of our new products could adversely affect our business or financial condition.

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

Our products may contain undetected errors or defects when first introduced or as new versions or new products are released. Disruptions affecting the introduction or release of, or other performance problems with, our products may damage our customers' businesses and could harm their and our reputation. If that occurs, we may incur significant costs, the attention of our key personnel could be diverted, or other significant customer relations problems may arise. We may also be subject to warranty and liability claims for damages related to errors or defects in our products. In addition, if we do not meet industry or quality standards, if applicable, our products may be subject to recall. A material liability claim, recall or other occurrence that harms our reputation or decreases market acceptance of our products could harm our business and operating results.

Although we do not, and cannot currently, promote the use of our products, or services based on our products, for diagnostic purposes, if our customers develop or use them for diagnostic purposes, someone could file a product liability claim alleging that one of our products contained a design or manufacturing defect that resulted in the failure to adequately perform, leading to death or injury. A product liability claim could result in

substantial damages and be costly and time consuming to defend, either of which could materially harm our business or financial condition. We cannot assure investors that our product liability insurance would adequately protect our assets from the financial impact of defending a product liability claim. Any product liability claim brought against us, with or without merit, could increase our product liability insurance rates or prevent us from securing insurance coverage in the future.

Our reliance on distributors for sales of our products outside of the United States could limit or prevent us from selling our products and could impact our revenue.

We intend to continue to grow our business internationally, and to do so we must attract additional distributors and retain existing distributors to maximize the commercial opportunity for our products. There is no guarantee that we will be successful in attracting or retaining desirable sales and distribution partners or that we will be able to enter into such arrangements on favorable terms. Distributors may not commit the necessary resources to market and sell our products to the level of our expectations or may choose to favor marketing the products of our competitors. If current or future distributors do not perform adequately, or we are unable to enter into effective arrangements with distributors in particular geographic areas, we may not realize long-term international revenue growth. In addition, if our distributors fail to comply with applicable laws and ethical standards, including anti-bribery laws, this could damage our reputation and could have a significant adverse effect on our business and our revenues.

We expect to generate a substantial portion of our revenue internationally in the future and can become further subject to various risks relating to our international activities, which could adversely affect our business, operating results and financial condition.

During 2017 approximately 60% of our product revenue was generated from customers located outside of the U.S. We believe that a substantial percentage of our future revenue will come from international sources as we expand our overseas operations and develop opportunities in additional areas. We have limited experience operating internationally and engaging in international business involves a number of difficulties and risks, including:

- required compliance with existing and changing foreign regulatory requirements and laws;
- difficulties and costs of staffing and managing foreign operations;
- difficulties protecting or procuring intellectual property rights;
- required compliance with anti-bribery laws, such as the U.S. Foreign Corrupt Practices Act, data privacy requirements, labor laws and anti-competition regulations;
- export or import restrictions;
- laws and business practices favoring local companies;
- longer payment cycles and difficulties in enforcing agreements and collecting receivables through certain foreign legal systems;
- political and economic instability; and
- potentially adverse tax consequences, tariffs, customs charges, bureaucratic requirements and other trade barriers.

Historically, most of our revenue has been denominated in U.S. dollars. In the future, we may sell our products and services in local currency outside of the U.S. As our operations in countries outside of the U.S. grow, our results of operations and cash flows may be subject to fluctuations due to changes in foreign currency exchange rates, which could harm our business in the future. For example, if the value of the U.S. dollar increases relative to foreign currencies, in the absence of a corresponding change in local currency prices, our

revenue could be adversely affected as we convert revenue from local currencies to U.S. dollars. If we dedicate significant resources to our international operations and are unable to manage these risks effectively, our business, operating results and financial condition will suffer.

We are subject to U.S. and foreign anti-corruption and anti-money laundering laws with respect to our operations and non-compliance with such laws can subject us to criminal and/or civil liability and harm our business.

We are subject to the U.S. Foreign Corrupt Practices Act, as amended, the U.S. domestic bribery statute contained in 18 U.S.C. § 201, the U.S. Travel Act, the USA PATRIOT Act, the United Kingdom Bribery Act 2010, and other state and national anti-bribery and anti-money laundering laws in countries in which we conduct activities. Anti-corruption laws are interpreted broadly and prohibit companies and their employees and third-party intermediaries from authorizing, promising, offering, providing, soliciting, or accepting, directly or indirectly, improper payments or benefits to or from any person whether in the public or private sector for the purpose of obtaining or retaining business or securing any other improper advantage. We rely on third-party representatives, distributors, and other business partners to support sales of our products and services and our efforts to ensure regulatory compliance. In addition, as we increase our international sales and business, we may engage with additional business partners. We can be held liable for the corrupt or other illegal activities of our employees, representatives, contractors, business partners, and agents, even if we do not explicitly authorize or have actual knowledge of such activities.

Any violations of anti-corruption and anti-money laundering 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.

We are subject to governmental export and import controls that could impair our ability to compete in international markets due to licensing requirements and subject us to liability if we are not in compliance with applicable laws.

Our products are subject to export control and import laws and regulations, including the U.S. Export Administration Regulations, U.S. Customs regulations, and various economic and trade sanctions regulations administered by the U.S. Treasury Department's Office of Foreign Assets Controls. Exports of our products must be made in compliance with these laws and regulations. If we fail to comply with these laws and regulations, we and certain of our employees could be subject to substantial civil or criminal penalties, including the possible loss of export or import privileges; fines, which may be imposed on us and responsible employees or managers; and, in extreme cases, the incarceration of responsible employees or managers.

In addition, changes in our products or changes in applicable export or import laws and regulations may create delays in the introduction and sale of our products in international markets, prevent our customers from deploying our products or, in some cases, prevent the export or import of our products to certain countries, governments or persons altogether. Any change in export or import laws and regulations, shift in the enforcement or scope of existing laws and regulations, or change in the countries, governments, persons or technologies targeted by such laws and regulations, could also result in decreased use of our products, or in our decreased ability to export or sell our products to existing or potential customers. Any decreased use of our products or limitation on our ability to export or sell our products would likely adversely affect our business, financial condition and results of operations.

If we are unable to recruit, train, retain, motivate and integrate key personnel, we may not achieve our goals.

Our future success depends on our ability to recruit, train, retain, motivate and integrate key personnel, including our recently expanded senior management team, as well as our research and development,

manufacturing and sales and marketing personnel. Competition for qualified personnel is intense. Our growth depends, in particular, on attracting and retaining highly-trained sales personnel with the necessary scientific background and ability to understand our systems at a technical level to effectively identify and sell to potential new customers and develop new products. Because of the complex and technical nature of our products and the dynamic market in which we compete, any failure to attract, train, retain, motivate and integrate qualified personnel could materially harm our operating results and growth prospects.

We have limited experience in marketing and selling our products, and if we are unable to successfully commercialize our products, our business and operating results will be adversely affected.

We have limited experience marketing and selling our products. We currently sell all our products for research use only, through our direct field sales and support organizations located in North America and Europe and through a combination of our own sales force and third-party distributors in additional major markets such as Australian, China, Japan and South Korea.

The future sales of our products will depend in large part on our ability to effectively market and sell our products, successfully manage and expand our sales force, and increase the scope of our marketing efforts. We may also enter into additional distribution arrangements in the future. Because we have limited experience in marketing and selling our products, our ability to forecast demand, the infrastructure required to support such demand and the sales cycle to customers is unproven. If we do not build an efficient and effective sales force, our business and operating results will be adversely affected.

We rely on a single contract manufacturer for our systems and rely on a single contract manufacturer for our chip consumables. If either of these manufacturers should fail or not perform satisfactorily, our ability to supply these instruments would be negatively and adversely affected.

We currently rely on a single contract manufacturer to manufacture and supply all of our instruments. See “Business–Key Agreements.” In addition, we rely on a single contract manufacturer to manufacture and supply all of our chip consumables. Since our contracts with these manufacturers do not commit them to supply quantities beyond the amounts included in our purchase orders, and do not commit them to carry inventory or make available any particular quantities, these contract manufacturers may give other customers’ needs higher priority than ours, and we may not be able to obtain adequate supplies in a timely manner or on commercially reasonable terms. If either of these manufacturers were to be unable to supply instruments, our business would be harmed.

In the event it becomes necessary to utilize different contract manufacturers for our instruments or chip consumables, we would experience additional costs, delays and difficulties in doing so as a result of identifying and entering into an agreement with a new supplier as well as preparing such new supplier to meet the logistical requirements associated with manufacturing our units, and our business would suffer. We may also experience additional costs and delays in the event we need access to or rights under any intellectual property of these current manufacturers.

We may experience manufacturing problems or delays that could limit the growth of our revenue or increase our losses.

We may encounter unforeseen situations that would result in delays or shortfalls in our production as well as delays or shortfalls caused by our outsourced manufacturing suppliers and by other third-party suppliers who manufacture components for our products. If we are unable to keep up with demand for our products, our revenue could be impaired, market acceptance for our products could be adversely affected and our customers might instead purchase our competitors’ products. Our inability to successfully manufacture our products would have a material adverse effect on our operating results.

We rely on a limited number of suppliers or, in some cases, one supplier, for some of our materials and components used in our consumable products, and may not be able to find replacements or immediately transition to alternative suppliers, which could have a material adverse effect on our business, financial condition, results of operations and reputation.

We rely on limited or sole suppliers for certain reagents and other materials and components that are used in our consumable products. While we periodically forecast our needs for such materials and enter into standard purchase orders with them, we do not have long-term contracts with many of these suppliers. If we were to lose such suppliers, there can be no assurance that we will be able to identify or enter into agreements with alternative suppliers on a timely basis on acceptable terms, if at all. An interruption in our operations could occur if we encounter delays or difficulties in securing these materials, or if the quality of the materials supplied do not meet our requirements, or if we cannot then obtain an acceptable substitute. The time and effort required to qualify a new supplier and ensure that the new materials provide the same or better quality results could result in significant additional costs. Any such interruption could significantly affect our business, financial condition, results of operations and reputation.

In addition, certain of the components used in our instruments are sourced from limited or sole suppliers. If we were to lose such suppliers, there can be no assurance that we will be able to identify or enter into agreements with alternative suppliers on a timely basis on acceptable terms, if at all. An interruption in our ability to sell and deliver instruments to customers could occur if we encounter delays or difficulties in securing these components, or if the quality of the components supplied do not meet specifications, or if we cannot then obtain an acceptable substitute. If any of these events occur, our business and operating results could be harmed.

If we cannot provide quality technical and applications support, we could lose customers and our business and prospects will suffer.

The placement of our products at new customer sites, the introduction of our technology into our customers' existing laboratory workflows and ongoing customer support can be complex. Accordingly, we need highly trained technical support personnel. Hiring technical support personnel is very competitive in our industry due to the limited number of people available with the necessary scientific and technical backgrounds and ability to understand our technology at a technical level. To effectively support potential new customers and the expanding needs of current customers, we will need to substantially expand our technical support staff. If we are unable to attract, train or retain the number of highly qualified technical services personnel that our business needs, our business and prospects will suffer.

Our business could be negatively impacted by cyber security threats.

In the ordinary course of our business, we collect and store sensitive data, intellectual property and proprietary business information owned or controlled by ourselves or our customers. We face various cyber security threats, including cyber security attacks to our information technology infrastructure and attempts by others to gain access to our proprietary or sensitive information. This information encompasses a wide variety of business-critical information including research and development information, commercial information, and business and financial information. The procedures and controls we use to monitor these threats and mitigate our exposure may not be sufficient to prevent cyber security incidents. The result of these incidents could include disrupted operations, lost opportunities, misstated financial data, liability for stolen assets or information, increased costs arising from the implementation of additional security protective measures, litigation and reputational damage. Any remedial costs or other liabilities related to cyber security incidents may not be fully insured or indemnified by other means.

The life sciences research and diagnostic markets are highly competitive. If we fail to effectively compete, our business, financial condition and operating results will suffer.

We face significant competition in the life sciences research and diagnostic markets. We currently compete with both established and early stage companies that design, manufacture and market systems and consumable

supplies. We believe our principal competitors in the life sciences research and genome mapping markets include Pacific Biosciences of California, Oxford Nanopore Technologies, 10x Genomics, Genomic Vision and Dovetail Genomics. In addition, there are a number of new market entrants in the process of developing novel technologies for the life sciences research, diagnostic and screening markets.

Many of our current competitors are either publicly traded, or are divisions of publicly-traded companies, and may enjoy a number of competitive advantages over us, including:

- greater name and brand recognition;
- substantially greater financial and human resources;
- broader product lines;
- larger sales forces and more established distributor networks;
- substantial intellectual property portfolios;
- larger and more established customer bases and relationships; and
- better established, larger scale, and lower cost manufacturing capabilities.

We believe that the principal competitive factors in all of our target markets include:

- cost of instruments and consumables;
- accuracy, including sensitivity and specificity, and reproducibility of results;
- reputation among customers;
- innovation in product offerings;
- flexibility and ease of use; and
- compatibility with existing laboratory processes, tools and methods.

We cannot assure investors that our products will compete favorably or that we will be successful in the face of increasing competition from new products and technologies introduced by our existing competitors or new companies entering our markets. In addition, we cannot assure investors that our competitors do not have or will not develop products or technologies that currently or in the future will enable them to produce competitive products with greater capabilities or at lower costs than ours. Any failure to compete effectively could materially and adversely affect our business, financial condition and operating results.

Acquisitions or joint ventures could disrupt our business, cause dilution to our stockholders and otherwise harm our business.

We may acquire other businesses, products or technologies as well as pursue strategic alliances, joint ventures, technology licenses or investments in complementary businesses. We have not made any acquisitions to date, and our ability to do so successfully is unproven. Any of these transactions could be material to our financial condition and operating results and expose us to many risks, including:

- disruption in our relationships with customers, distributors or suppliers as a result of such a transaction;
- unanticipated liabilities related to acquired companies;
- difficulties integrating acquired personnel, technologies and operations into our existing business;
- diversion of management time and focus from operating our business to acquisition integration challenges;

- increases in our expenses and reductions in our cash available for operations and other uses; and
- possible write-offs or impairment charges relating to acquired businesses.

Foreign acquisitions involve unique risks in addition to those mentioned above, including those related to integration of operations across different cultures and languages, currency risks and the particular economic, political and regulatory risks associated with specific countries.

Also, the anticipated benefit of any acquisition may not materialize. Future acquisitions or dispositions could result in potentially dilutive issuances of our equity securities, the incurrence of debt, contingent liabilities or amortization expenses or write-offs of goodwill, any of which could harm our financial condition. We cannot predict the number, timing or size of future joint ventures or acquisitions, or the effect that any such transactions might have on our operating results.

Risks related to government regulation and diagnostic product reimbursement

If the FDA determines that our products are medical devices or if we seek to market our products for clinical diagnostic or health screening use, we will be required to obtain regulatory clearance(s) or approval(s), and may be required to cease or limit sales of our then marketed products, which could materially and adversely affect our business, financial condition and results of operations. Any such regulatory process would be expensive, time-consuming and uncertain both in timing and in outcome.

We have focused initially on the life sciences research market. This includes laboratories associated with academic and governmental research institutions, as well as pharmaceutical, biotechnology and contract research companies. Accordingly, our products are labeled as “Research Use Only,” or RUO, and are not intended for diagnostic use. While we have focused initially on the life sciences research market and RUO products only, our strategy is to expand our product line to encompass products that are intended to be used for the diagnosis of disease, either alone or in collaboration with third parties (such as our collaboration with Berry Genomics). Such in-vitro diagnostic, or IVD, products will be subject to regulation by the FDA as medical devices, or comparable international agencies, including requirements for regulatory clearance or approval of such products before they can be marketed. If the FDA were to determine that our products are intended for clinical use or if we decided to market our products for such use, we would be required to obtain FDA 510(k) clearance or premarket approval in order to sell our products in a manner consistent with FDA laws and regulations. Such regulatory approval processes or clearances are expensive, time-consuming and uncertain; our efforts may never result in any approved premarket approval application, or PMA, or 510(k) clearance for our products; and failure by us or a collaborator to obtain or comply with such approvals and clearances could have an adverse effect on our business, financial condition or operating results.

IVD products may be regulated as medical devices by the FDA and comparable international agencies and may require either clearance from the FDA following the 510(k) pre-market notification process or PMA from the FDA, in each case prior to marketing. If we or our collaborators are required to obtain a PMA or 510(k) clearance for products based on our technology, we or they would be subject to a substantial number of additional requirements for medical devices, including establishment registration, device listing, Quality Systems Regulations which cover the design, testing, production, control, quality assurance, labeling, packaging, servicing, sterilization (if required), and storage and shipping of medical devices (among other activities), product labeling, advertising, recordkeeping, post-market surveillance, post-approval studies, adverse event reporting, and correction and removal (recall) regulations. One or more of the products we or a collaborator may develop using our technology may also require clinical trials in order to generate the data required for PMA approval. Complying with these requirements may be time-consuming and expensive. We or our collaborators may be required to expend significant resources to ensure ongoing compliance with the FDA regulations and/or take satisfactory corrective action in response to enforcement action, which may have a material adverse effect on the ability to design, develop, and commercialize products using our technology as planned. Failure to comply

with these requirements may subject us or a collaborator to a range of enforcement actions, such as warning letters, injunctions, civil monetary penalties, criminal prosecution, recall and/or seizure of products, and revocation of marketing authorization, as well as significant adverse publicity. If we or our collaborators fail to obtain, or experience significant delays in obtaining, regulatory approvals for IVD products, such products may not be able to be launched or successfully commercialized in a timely manner, or at all.

Laboratory developed tests, or LDTs, are a subset of IVD tests that are designed, manufactured and used within a single laboratory. The FDA maintains that LDTs are medical devices and has for the most part exercised enforcement discretion for most LDTs. A significant change in the way that the FDA regulates any LDTs that we, our collaborators or our customers develop using our technology could affect our business. If the FDA requires laboratories to undergo premarket review and comply with other applicable FDA requirements in the future, the cost and time required to commercialize an LDT will increase substantially, and may reduce the financial incentive for laboratories to develop LDTs, which could reduce demand for our instruments and our other products. In addition, if the FDA were to change the way that it regulates LDTs to require that we undergo pre-market review or comply with other applicable FDA requirements before we can sell our instruments or our other products to clinical cytogenics laboratories, our ability to sell our instruments and other products to this addressable market would be delayed, thereby impeding our ability to penetrate this market and generate revenue from sales of our instruments and our other products.

Failure to comply with applicable FDA requirements could subject us to misbranding or adulteration allegations under the Federal Food, Drug, and Cosmetic Act. We could be subject to a range of enforcement actions, including warning letters, injunctions, civil monetary penalties, criminal prosecution, and recall and/or seizure of products, as well as significant adverse publicity. In addition, changes to the current regulatory framework, including the imposition of additional or new regulations, could arise at any time during the development or marketing of our products, which may negatively affect our ability to obtain or maintain FDA or comparable regulatory approval of our products, if required.

Foreign jurisdictions have laws and regulations similar to those described above, which may adversely affect our ability to market our products as planned in such countries. The number and scope of these requirements are increasing. As in the U.S., the cost and time required to comply with regulatory requirements may be substantial, and there is no guarantee that we will obtain the necessary authorization(s) required to make our products commercially viable. As a result, the imposition of foreign requirements may also have a material adverse effect on the commercial viability of our operations.

We expect to rely on third parties in conducting any required future studies of diagnostic products that may be required by the FDA or other regulatory authorities, and those third parties may not perform satisfactorily.

We do not have the ability to independently conduct clinical trials or other studies that may be required to obtain FDA and other regulatory clearance or approval for future diagnostic products. Accordingly, we expect that we would rely on third parties, such as clinical investigators, consultants, and collaborators to conduct such studies if needed. Our reliance on these third parties for clinical and other development activities would reduce our control over these activities. If these third parties do not successfully carry out their contractual duties or regulatory obligations or meet expected deadlines, if the third parties need to be replaced or if the quality or accuracy of the data they obtain is compromised, we may not be able to obtain regulatory clearance or approval.

If diagnostic procedures that are enabled by our technology are subject to unfavorable pricing regulations or third-party coverage and reimbursement policies, our business could be harmed.

Currently, our product is for research use only, but clinical laboratories may acquire our instrumentation through a capital purchase or capital lease and use the Saphyr and direct label stain chemistry to create their own potentially reimbursable products, such as laboratory developed tests for in vitro diagnostics. Our customers may generate revenue for these testing services by seeking the necessary approval of their product from the FDA or

the Center for Medicare and Medicaid Services, or CMS, along with coverage and reimbursement from third-party payors, including government health programs and private health plans. The ability of our customers to commercialize diagnostic tests based on our technology will depend in part on the extent to which coverage and reimbursement for these test will be available from such third-party payors.

In the U.S., molecular testing laboratories have multiple options for reimbursement coding, but we expect that the primary codes used will be the genomic sequencing procedure codes, or GSPs. The American Medical Association, or AMA, added GSPs to its clinical laboratory fee schedule in 2015. In addition, CMS recently issued a coverage determination providing for the reimbursement of next-generation sequencing for certain cancer diagnostics using an FDA-approved in vitro diagnostic test. Private health plans often follow CMS to a substantial degree, and it is difficult to predict what CMS will decide with respect to reimbursement of any products our customers try to commercialize.

In Europe, coverage for molecular diagnostic testing is varied. Countries with statutory health insurance (e.g., Germany, France, The Netherlands) tend to be more progressive in technology adoption with favorable reimbursement for molecular diagnostic testing. In countries such as the United Kingdom with tax-based insurance, adoption and reimbursement for molecular diagnostic testing is not uniform and is influenced by local budgets.

Ultimately, coverage and reimbursement of new products is uncertain, and whether laboratories that use our instruments to develop their own products will attain coverage and adequate reimbursement is unknown. In the U.S., there is no uniform policy for determining coverage and reimbursement. Coverage can differ from payor to payor, and the process for determining whether a payor will provide coverage may be separate from the process for setting the reimbursement rate, In addition, the U.S. government, state legislatures and foreign governments have shown significant interest in implementing cost containment programs to limit the growth of government-paid health care costs, including price controls and restrictions on reimbursement. We cannot be sure that coverage will be available for any diagnostic tests based on our technology, and, if coverage is available, the level of payments. Reimbursement may impact the demand for those tests. If reimbursement is not available or is available only to limited levels, our customers may not be able to successfully commercialize any tests for which they receive marketing authorization.

Current and future legislation may increase the difficulty and cost to obtain marketing approval of and commercialize any products based on our technology and affect the prices that may be obtained.

In March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Affordability Reconciliation Act, collectively, the ACA, became law. The ACA is a sweeping law intended to broaden access to health insurance, reduce or constrain the growth of healthcare spending, enhance remedies against fraud and abuse, add new transparency requirements for the healthcare and health insurance industries, impose new taxes and fees on the health industry and impose additional health policy reforms. The ACA's provisions of importance to our business include, but are not limited to, a 2.3% excise tax on certain entities that manufacture or import medical devices offered for sale in the U.S., with limited exceptions, which has been suspended, but due to subsequent legislative amendments, will be automatically reinstated for medical device sales beginning January 1, 2020, unless Congress takes additional action to delay the implementation of the tax.

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 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 or otherwise circumvent some of the requirements for health insurance mandated by 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, two bills affecting the implementation of certain taxes under the ACA

have been signed into law. The 2017 U.S. Tax Cuts and Jobs Act, includes a provision repealing, effective January 1, 2019, the tax-based shared responsibility payment imposed by the ACA on certain individuals who fail to maintain qualifying health coverage for all or part of a year that is commonly referred to as the "individual mandate". Additionally, a 2018 continuing resolution on appropriations delays the implementation of certain ACA-mandated fees, including, without limitation, the medical device excise tax.

In addition, other legislative changes have been proposed and adopted since the ACA was enacted. For example, on April 1, 2014, the Protecting Access to Medicare Act of 2014, or PAMA, was signed into law, which, among other things, significantly altered the payment methodology under the Medicare Clinical Laboratory Fee Schedule, or CLFS. PAMA requires certain laboratories performing clinical diagnostic laboratory tests to report to CMS the amounts paid by private payors for laboratory tests. Beginning January 1, 2018, CMS will use reported private payor pricing to periodically revise payment rates under the CLFS.

We expect that the ACA, as well as other healthcare reform measures that may be adopted in the future, may result in more rigorous coverage criteria and additional downward pressure on the price that we or our collaborators will receive for any cleared or approved product. Any reduction in payments from Medicare or other government programs may result in a similar reduction in payments from private payors. The implementation of cost containment measures or other healthcare reforms may prevent our customers from successfully commercializing any tests for which they receive approval, which could prevent us from being able to generate revenue and attain profitability.

In addition, sales of our instruments outside of the U.S. will subject us to foreign regulatory requirements, which may also change over time.

We cannot predict whether future healthcare initiatives will be implemented at the federal or state level or in countries outside of the U.S. in which we may do business, or the effect any future legislation or regulation will have on us. The expansion in government's effect on the U.S. healthcare industry may result in decreased profits to us, lower reimbursements by payors for our products or reduced medical procedure volumes, all of which may adversely affect our business, financial condition and results of operations.

We may be subject, directly or indirectly, to federal and state healthcare fraud and abuse laws and other federal and state laws applicable to our marketing practices. If we are unable to comply, or have not complied, with such laws, we could face substantial penalties.

Our operations are directly or indirectly, through our customers, subject to various federal and state fraud and abuse laws, including, without limitation, the federal and state anti-kickback statutes and false claims laws. These laws may impact, among other things, our sales and marketing and education programs, and our financial and business relationships with researchers who use our instruments to develop marketed products. By way of example: the federal Anti-Kickback Statute prohibits, among other things, any person or entity from, among other things, knowingly and willfully soliciting, receiving, offering or paying any remuneration, directly or indirectly, to induce, or in return for, purchasing, leasing, ordering, or arranging for or recommending the purchase, lease, or order of any good, facility, item, or service reimbursable, in whole or in part, under a federal healthcare program; and the federal false claims laws, including, without limitation the federal civil False Claims Act, prohibit, among other things, anyone from knowingly and willingly presenting, or causing to be presented for payment, to the federal government (including Medicare and Medicaid) claims for reimbursement for, among other things, drugs or services that are false or fraudulent, claims for items or services not provided as claimed, or claims for medically unnecessary items or services. The ACA, among other things, amended the intent requirement of the federal Anti-Kickback Statute to clarify that 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 crime. In addition, the ACA clarifies that the government may assert that a claim that includes items or service resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the federal civil False Claims Act.

In addition, we may be subject to the Health Insurance Portability and Accountability Act of 1996, or HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act and its implementing regulations, which imposes certain requirements relating to the privacy, security and transmission of individually identifiable health information without appropriate authorization by entities subject to the rule, such as health plans, health care clearinghouses and certain health care providers and their business associates who create, use or disclose HIPAA protected health information on their behalf. We may also be subject to state and foreign laws that govern the privacy and security of health information in some circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

If our operations are found to be in violation of any of these laws, we may be subject to penalties, including, without limitation, civil, criminal, and administrative penalties, damages, fines, disgorgement, the curtailment or restructuring of our operations, exclusion from participation in federal and state healthcare programs, additional integrity oversight and reporting obligations, individual imprisonment, contractual damages, and reputational harm, any of which could adversely affect our ability to operate our business and our results of operations.

Risks Related to Intellectual Property

If we are unable to protect our intellectual property, it may reduce our ability to maintain any technological or competitive advantage over our competitors and potential competitors, and our business may be harmed.

We rely on patent protection as well as trademark, copyright, trade secret and other intellectual property rights protection and contractual restrictions to protect our proprietary technologies, all of which provide limited protection and may not adequately protect our rights or permit us to gain or keep any competitive advantage. As of April 13, 2018, we were the assignee or assignee-applicant of 10 granted U.S. patents and approximately 12 pending U.S. patent applications. We also were the assignee-applicant of approximately 79 pending patent applications and granted patents in particular jurisdictions outside the U.S. If we fail to protect and/or maintain our intellectual property, third parties may be able to compete more effectively against us, we may lose our technological or competitive advantage, and/or we may incur substantial litigation costs in our attempts to recover or restrict use of our intellectual property.

We cannot assure investors that any of our currently pending or future patent applications will result in granted patents, and we cannot predict how long it will take for such patents to issue, if at all. It is possible that, for any of our patents that have issued or that may issue in the future, our competitors may design their products around our patented technologies. Further, we cannot assure investors that other parties will not challenge any patents granted to us, or that courts or regulatory agencies will hold our patents to be valid, enforceable, and/or infringed. We cannot guarantee investors that we will be successful in defending challenges made against our patents and patent applications. Any successful third-party challenge or challenges to our patents could result in the unenforceability or invalidity of such patents, or such patents being interpreted narrowly and/or in a manner adverse to our interests. Our ability to establish or maintain a technological or competitive advantage over our competitors and/or market entrants may be diminished because of these uncertainties. For these and other reasons, our intellectual property may not provide us with any competitive advantage. For example:

- we or our licensors might not have been the first to make the inventions claimed or disclosed by our pending patent applications or issued patents;
- we or our licensors might not have been the first to file patent applications for these inventions. To determine the priority of these inventions, we may have to participate in interference proceedings or derivation proceedings declared by the U.S. Patent and Trademark Office, or the USPTO, which could result in substantial cost to us, and could possibly result in a loss or narrowing of patent rights. No assurance can be given that our patent applications or granted patents (or those of our licensors) will have priority over any other patent or patent application involved in such a proceeding, or will be held valid as an outcome of the proceeding;

- other parties may independently develop similar or alternative products and technologies or duplicate any of our products and technologies, which can potentially impact our market share, revenue, and goodwill, regardless of whether intellectual property rights are successfully enforced against these other parties;
- it is possible that our owned or licensed pending patent applications will not result in granted patents, and even if such pending patent applications issue as patents, they may not provide intellectual property protection of commercially viable products or product features, may not provide us with any competitive advantages, or may be challenged and invalidated by third parties, patent offices, and/or the courts;
- we may be unaware of or unfamiliar with prior art and/or interpretations of prior art that could potentially impact the validity or scope of our patents or pending patent applications, or patent applications that we intend to file;
- we take efforts and enter into agreements with employees, consultants, collaborators, and advisors to confirm ownership and chain of title in intellectual property rights. However, an inventorship or ownership dispute could arise that may permit one or more third parties to practice or enforce our intellectual property rights, including possible efforts to enforce rights against us;
- we may elect not to maintain or pursue intellectual property rights that, at some point in time, may be considered relevant to or enforceable against a competitor;
- we may not develop additional proprietary products and technologies that are patentable, or we may develop additional proprietary products and technologies that are not patentable ;
- the patents or other intellectual property rights of others may have an adverse effect on our business; and
- we apply for patents relating to our products and technologies and uses thereof, as we deem appropriate. However, we or our representatives or their agents may fail to apply for patents on important products and technologies in a timely fashion or at all, or we or our representatives or their agents may fail to apply for patents in potentially relevant jurisdictions.

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

Software is an important component of at least some of our products and services. To the extent such software is not protected by our patents, our dependence on trade secret protection may not provide adequate protection. In addition, the Supreme Court's ruling *Alice Corporation Pty. Ltd. v. CLS Bank International*, has narrowed the scope of patent protection available for software in certain circumstances.

The measures that we use to protect the security of our intellectual property and other proprietary rights may not be adequate, which could result in the loss of legal protection for, and thereby diminish the value of, such intellectual property and other rights.

In addition to pursuing patents on our technology, we also rely upon trademarks, trade secrets, copyrights and unfair competition laws, as well as license agreements and other contractual provisions, to protect our intellectual property and other proprietary rights. Despite these measures, any of our intellectual property rights could be challenged, invalidated, circumvented or misappropriated. In addition, we take steps to protect our intellectual property and proprietary technology by entering into confidentiality agreements and intellectual property assignment agreements with our employees, consultants, corporate partners and, when needed, our advisors. Such agreements may not be enforceable or may not provide meaningful protection for our trade secrets

and/or other proprietary information in the event of unauthorized use or disclosure or other breaches of the agreements, and we may not be able to prevent such unauthorized disclosure. Moreover, if a party having an agreement with us has an overlapping or conflicting obligation to a third party, our rights in and to certain intellectual property could be undermined. Monitoring unauthorized and inadvertent disclosure is difficult, and we do not know whether the steps we have taken to prevent such disclosure are, or will be, adequate. If we were to enforce a claim that a third party had illegally obtained and was using our trade secrets, it would be expensive and time consuming, the outcome would be unpredictable, and any remedy may be inadequate. In addition, courts outside the U.S. may be less willing to protect trade secrets.

In addition, competitors could purchase our products and attempt to replicate and/or improve some or all of the competitive advantages we derive from our development efforts, willfully infringe our intellectual property rights, design their products around our protected technology or develop their own competitive technologies that fall outside of our intellectual property rights. If our intellectual property does not adequately protect our market share against competitors' products and methods, our competitive position could be adversely affected, as could our business.

We have rights in some intellectual property that has been discovered through government funded programs and thus is subject to federal regulations such as "march-in" rights, certain reporting requirements, and a preference for U.S. industry. Compliance with such regulations may limit our exclusive rights, subject us to expenditure of resources with respect to reporting requirements, and limit our ability to contract with non-U.S. manufacturers.

Some of the intellectual property rights assigned to us and/or in-licensed to us have been generated through the use of U.S. government funding and are therefore subject to certain federal regulations. For example, all of the intellectual property rights licensed to us under our license agreement with Princeton University have been generated using U.S. government funds. As a result, the U.S. government has certain rights to intellectual property embodied in our current or future products pursuant to the Bayh-Dole Act of 1980. These U.S. government rights in certain inventions developed under a government-funded program include a non-exclusive, non-transferable, irrevocable worldwide license to use inventions for any governmental purpose. In addition, the U.S. government has the right to require us to grant exclusive, partially exclusive, or non-exclusive licenses to any of these inventions to a third party if the government determines that: (i) adequate steps have not been taken to commercialize the invention; (ii) government action is necessary to meet public health or safety needs; or (iii) government action is necessary to meet requirements for public use under federal regulations (also referred to as "march-in rights"). The U.S. government also has the right to take title to these inventions if we fail, or the applicable licensor fails, to disclose the invention to the government, elect title, and file an application to register the intellectual property within specified time limits. In addition, the U.S. government may acquire title to these inventions in any country in which a patent application is not filed within specified time limits. Intellectual property generated under a government funded program is also subject to certain reporting requirements, compliance with which may require us, or the applicable licensor, to expend substantial resources. In addition, the U.S. government requires that any products embodying the subject invention or produced through the use of the subject invention be manufactured substantially in the U.S. The manufacturing preference requirement can be waived if the owner of the intellectual property can show that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the U.S. or that, under the circumstances, domestic manufacture is not commercially feasible. This preference for U.S. manufacturing may limit our ability to license the applicable patent rights on an exclusive basis under certain circumstances.

If we enter into future arrangements involving government funding, and we make inventions as a result of such funding, intellectual property rights to such discoveries may be subject to the applicable provisions of the Bayh-Dole Act. To the extent any of our current or future intellectual property is generated through the use of U.S. government funding, the provisions of the Bayh-Dole Act may similarly apply. Any exercise by the government of certain of its rights could harm our competitive position, business, financial condition, results of operations and prospects.

We depend on technology that is licensed to us by Princeton University. Any loss of our rights to this technology could prevent us from selling our products.

Some technology that relates to analysis of nucleic acids is licensed exclusively to us from Princeton University, or Princeton. We do not own the patents that underlie this license. Our rights to use this technology and employ the inventions claimed in the licensed patents are subject to the continuation of and compliance with the terms of the license. Our principal obligations under our license agreement with Princeton are as follows:

- royalty payments;
- annual maintenance fees;
- using commercially reasonable efforts to develop and sell a product using the licensed technology and developing a market for such product;
- paying and/or reimbursing fees related to prosecution, maintenance and enforcement of patent rights; and
- providing certain reports.

If we breach any of these obligations, Princeton may have the right to terminate or modify the license, which could result in our being unable to develop, manufacture and sell our products or a competitor gaining access to the relevant technology. Termination or certain modifications of our license agreement with Princeton would have a material adverse effect on our business.

In addition, we are a party to a number of other agreements that include licenses to intellectual property, including non-exclusive licenses. We may need to enter into additional license agreements in the future. Our business could suffer, for example, if any current or future licenses terminate, if the licensors fail to abide by the terms of the license, 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.

As we have done previously, we may need or may choose to obtain licenses and/or acquire intellectual property rights from third parties to advance our research or begin commercialization of our current or future products, and

we cannot provide any assurances that third-party patents do not exist that might be enforced against our current or future products in the absence of such a license. We may fail to obtain any of these licenses or intellectual property rights on commercially reasonable terms. Even if we are able to obtain a license, it may be non-exclusive, thereby giving our competitors access to the same technologies licensed to us. In that event, we may be required to expend significant time and resources to develop or license replacement technology. If we are unable to do so, we may be unable to develop or commercialize the affected products, which could materially harm our business and the third parties owning such intellectual property rights could seek either an injunction prohibiting our sales, or, with respect to our sales, an obligation on our part to pay royalties and/or other forms of compensation.

Licensing of intellectual property is important to our business and involves complex legal, business and scientific issues. Disputes may arise between us and our licensors regarding intellectual property subject to a license agreement, including:

- the scope of rights granted under the license agreement and other interpretation-related issues;
- whether and the extent to which our technology and processes infringe any intellectual property of the licensor that is not subject to the licensing agreement;
- whether to take action to enforce any intellectual property rights against an allegedly infringing product or process of a third party;

- our right to sublicense patent and other rights to third parties;
- our diligence obligations with respect to the use of licensed technology in relation to our development and commercialization of our products, and what activities satisfy those diligence obligations; and
- the ownership of inventions and know-how, such as intellectual property resulting from the joint creation or use of intellectual property by our licensors and us and our partners.

If disputes over intellectual property that we have licensed prevent or impair our ability to maintain our current licensing arrangements on acceptable terms, we may be unable to successfully develop and commercialize the affected product, or the dispute may have an adverse affect on our results of operation.

In addition to agreements pursuant to which we in-license intellectual property, we may in the future grant licenses under our intellectual property, or sell certain intellectual property. Like in-licenses, out-licenses can be complex and disputes may arise between us and our licensees, such as the types of disputes described above. Moreover, licensees may breach their obligations, or we may be exposed to liability due to our failure or alleged failure to satisfy our obligations. Any such occurrence could have an adverse affect on our business.

If we or any of our partners is sued for infringing intellectual property rights of third parties, it would be costly and time consuming, and an unfavorable outcome in that litigation could have a material adverse effect on our business.

Our success also depends on our ability to develop, manufacture, market and sell our products and perform our services without infringing the proprietary rights of third parties. Numerous U.S. and foreign-issued patents and pending patent applications owned by third parties exist in the fields in which we are developing products and services. As part of a business strategy to impede our successful commercialization and entry into new markets, competitors may allege that our products and/or services infringe their intellectual property rights.

We could incur substantial costs and divert the attention of our management and technical personnel in defending ourselves against claims of infringement made by third parties. Any adverse ruling by a court or administrative body, or perception of an adverse ruling, may have a material adverse impact on our ability to conduct our business and our finances. Moreover, third parties making claims against us may be able to obtain injunctive relief against us, which could block our ability to offer one or more products or services and could result in a substantial award of damages against us. In addition, since we sometimes indemnify customers, collaborators or licensees, we may have additional liability in connection with any infringement or alleged infringement of third party intellectual property. Intellectual property litigation can be very expensive, and we may not have the financial means to defend ourselves or our customers, collaborators and licensees.

Because patent applications can take many years to issue, there may be pending applications, some of which are unknown to us, that may result in issued patents upon which our products or proprietary technologies may infringe. Moreover, we may fail to identify issued patents of relevance or incorrectly conclude that an issued patent is invalid or not infringed by our technology or any of our products. There is a substantial amount of litigation involving patents and other intellectual property rights in our industry. If a third-party claims that we or any of our licensors, customers or collaboration partners infringe upon a third-party's intellectual property rights, we may have to:

- seek to obtain licenses that may not be available on commercially reasonable terms, if at all;
- abandon any product alleged or held to infringe, or redesign our products or processes to avoid potential assertion of infringement;
- pay substantial damages including, in exceptional cases, treble damages and attorneys' fees, which we may have to pay if a court decides that the product or proprietary technology at issue infringes upon or violates the third-party's rights;

- pay substantial royalties or fees or grant cross-licenses to our technology; or
- defend litigation or administrative proceedings that may be costly whether we win or lose, and which could result in a substantial diversion of our financial and management resources.

We may be involved in lawsuits to protect or enforce our patents or the patents of our licensors, which could be expensive, time-consuming and unsuccessful.

Competitors may infringe our patents or the patents we license in. In the event of infringement or unauthorized use, we may file one or more infringement lawsuits, which can be expensive and time-consuming. An adverse result in any such litigation proceedings could put one or more of our patents at risk of being invalidated, being found to be unenforceable, and/or being interpreted narrowly and could put our patent applications at risk of not issuing and/or could impact the validity or enforceability positions of our other patents or those we license. 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.

Most of our competitors are larger than we are and have substantially greater resources. They are, therefore, likely to be able to sustain the costs of complex patent litigation longer than we could. In addition, the uncertainties associated with litigation could have a material adverse effect on our ability to raise the funds necessary to continue our operations, continue our internal research programs, in-license needed technology, pursue, obtain or maintain intellectual property rights, or enter into development partnerships that would help us bring our products to market.

In addition, patent litigation can be very costly and time-consuming. An adverse outcome in such litigation or proceedings may expose us or any of our future development partners to loss of our proprietary position, expose us to significant liabilities, or require us to seek licenses that may not be available on commercially acceptable terms, if at all.

Our issued patents could be found invalid or unenforceable if challenged in court or at the Patent Office or other administrative agency, which could have a material adverse impact on our business.

If we or any of our partners were to initiate legal proceedings against a third party to enforce a patent related to one of our products or services, the defendant in such litigation could counterclaim that our patent is invalid and/or unenforceable. In patent litigation in the U.S., defendant counterclaims alleging invalidity and/or unenforceability are commonplace, as are validity challenges by the defendant against the subject patent or other patents before the USPTO. 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, failure to meet the written description requirement, indefiniteness, and/or failure to disclose the best mode or to claim patent eligible subject matter. Grounds for an unenforceability assertion could be an allegation that someone connected with prosecution of the patent intentionally withheld material information from the USPTO, or made a misleading statement, during prosecution. Additional grounds for an unenforceability assertion include an allegation of misuse or anticompetitive use of patent rights, and an allegation of incorrect inventorship with deceptive intent. Third parties may also raise similar claims before the USPTO even outside the context of litigation. The outcome is unpredictable following legal assertions of invalidity and unenforceability. With respect to the validity question, for example, we cannot be certain that no invalidating prior art existed of which we and the patent examiner were unaware during prosecution. These assertions may also be based on information known to us or the Patent Office. If a defendant or third party were to prevail on a legal assertion of invalidity and/or unenforceability, we would lose at least part, and perhaps all, of the claims of the challenged patent. Such a loss of patent protection would or could have a material adverse impact on our business.

We may be subject to claims that our employees, consultants or independent contractors have wrongfully used or disclosed alleged trade secrets of their other clients or former employers to us, and/or that their other clients or former employers allegedly have rights in our intellectual property, which could subject us to costly litigation.

As is common in the life sciences industry, we engage the services of consultants and independent contractors to assist us in the development of our products. Many of these consultants and independent contractors were previously employed at, or may have previously or may be currently providing consulting or other services to, universities or other technology, biotechnology or pharmaceutical companies, including our competitors or potential competitors. We may become subject to claims that our company, a consultant or an independent contractor inadvertently or otherwise used or disclosed trade secrets or other information proprietary to their former employers or their former or current clients. We may similarly be subject to claims stemming from similar actions of an employee, such as one who was previously employed by another company, including a competitor or potential competitor. We may become subject to claims that one or more current or former employees, consultants, advisors, or independent contractors of ours owns rights in our intellectual property and/or has assigned or is under an obligation to assign rights in our intellectual property to another party. This may include a competitor of ours. If a competitor has rights in our patents, the competitor or a licensee or related entity may be able to make, use, sell, import, and/or export the patented technology without liability to us under our patents or the patents we license. Litigation may be necessary to defend against these claims. Even if we are successful in defending against these claims, litigation could result in substantial costs and be a distraction to our management team. If we were not successful we could lose valuable intellectual property rights.

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

We generally enter into confidentiality and intellectual property assignment agreements with our employees, consultants, and contractors. These agreements generally provide that inventions conceived by the party in the course of rendering services to us will be our exclusive property. However, those agreements may not be honored and may not effectively assign or may be alleged to ineffectively assign intellectual property rights to us. For example, even if we have a consulting agreement in place with an academic advisor pursuant to which such academic advisor is required to assign any inventions developed in connection with providing services to us, such academic advisor may not have the right to assign such inventions to us, as it may conflict with his or her obligations to assign all such intellectual property to his or her employing institution.

In addition, we sometimes enter into agreements where we provide services to third parties, such as customers. Under such circumstances, our agreements may provide that certain intellectual property that we conceive in the course of providing those services is assigned to the customer. In those cases, we may not be able to use that particular intellectual property in, for example, our work for other customers without a license.

We may not be able to protect our intellectual property rights throughout the world, which could materially and negatively affect our business.

Filing, prosecuting, maintaining, and defending patents on current and future products in all countries throughout the world would be prohibitively expensive, and our intellectual property rights in some countries outside the U.S. can be less extensive than those in the U.S. In addition, the laws of some foreign countries do not protect intellectual property rights to the same extent as federal and state laws in the U.S. Consequently, regardless of whether we are able to prevent third parties from practicing our inventions in the U.S., we may not be able to prevent third parties from practicing our inventions in all countries outside the U.S., or from selling or importing products made using our inventions in and into the U.S. or other jurisdictions. Competitors may use our technologies in jurisdictions where we have not pursued and obtained patent protection to develop their own products, and further, may export otherwise infringing products to territories where we have patent protection, but enforcement is not as strong as it is in the U.S. 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. Even if we pursue and obtain issued patents in particular jurisdictions, our patent claims or other intellectual property rights may not be effective or sufficient to prevent third parties from so competing. 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.

Many companies have encountered significant problems in protecting and defending intellectual property rights in foreign jurisdictions. The legal systems of certain countries, particularly certain developing 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 or marketing of competing products in violation of our proprietary rights generally. 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, could put our patents at risk of being invalidated or interpreted narrowly and our patent applications at risk of not issuing, and could provoke third parties to assert claims against us. We may not prevail in any lawsuits that we initiate and the damages or other remedies awarded, if any, may not be commercially meaningful. Accordingly, our efforts to enforce our intellectual property rights around the world may be inadequate to obtain a significant commercial advantage from the intellectual property that we develop or license and may adversely impact our business.

In addition, we and our partners also face the risk that our products or components thereof are imported, reimported, or exported into markets with relatively higher prices from markets with relatively lower prices, which would result in a decrease of sales and any payments we receive from the affected market. Recent developments in U.S. patent law have made it more difficult to stop these and related practices based on theories of patent infringement.

Changes in patent laws or patent jurisprudence could diminish the value of patents in general, thereby impairing our ability to protect our products.

As is the case with other life science industry companies, our success is heavily dependent on intellectual property, particularly patents. Obtaining and enforcing patents involve both technological complexity and legal complexity. Therefore, obtaining and enforcing patents is costly, time-consuming and inherently uncertain. In addition, the America Invents Act, or the AIA, became effective on March 16, 2013.

An important change introduced by the AIA is that the U.S. transitioned to a “first-to-file” system for deciding which party should be granted a patent when two or more patent applications are filed by different parties claiming the same invention. A third party that files a patent application in the USPTO after that date but before us could therefore be awarded a patent claiming or disclosing an invention of ours even if we had made the invention before it was made by the third party. This will require us to be cognizant going forward of the time from invention to filing of a patent application, but circumstances could prevent us from promptly filing patent applications on our inventions. Additionally, there can be a trade-off between obtaining an earlier filing date, and waiting to obtain additional data and/or further refine a patent application. In some circumstances, the effects of a decision to pursue an earlier filing or a later filing will not be known until prior art or third party activities are subsequently discovered, such as by the USPTO or by a third party seeking to challenge patent rights. These circumstances may apply, for example, to patent applications prepared and filed around the time of the implementation of the AIA, or with a priority application that preceded the implementation of the AIA.

Among some of the other changes introduced by the AIA are changes that limit where a patent holder may file a patent infringement suit and providing additional opportunities for third parties to challenge an issued patent in the USPTO. This applies to all of our owned and in-licensed U.S. patents, even those issued before March 16, 2013. Because of a lower standard for evidence in USPTO proceedings compared to the standard for evidence in U.S. federal courts necessary to invalidate a patent claim, a third party could potentially provide

evidence in a USPTO proceeding sufficient for the USPTO to hold a claim invalid even though the same evidence would be insufficient to invalidate the claim if first presented in a court action. Accordingly, a third party may try to use the USPTO procedures to invalidate our patent claims that would not have been invalidated if first challenged by the third party in court. 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. In addition, the contours of the laws under the AIA are subject to further judicial interpretation and/or legislative changes.

Additionally, the U.S. Supreme Court has ruled on several patent cases in recent years, such as *Impression Products, Inc. v. Lexmark International, Inc.*, *Association for Molecular Pathology v. Myriad Genetics, Inc*., *Mayo Collaborative Services v. Prometheus Laboratories, Inc.* and *Alice Corporation Pty. Ltd. v. CLS Bank International*, either narrowing the scope of patent protection available in certain circumstances or weakening the rights of patent owners in certain situations. In addition to increasing uncertainty with our ability to obtain patents in the future, this combination of events has created uncertainty as to the value of patents, once obtained, including patents in the molecular biology analysis and diagnostic space in particular. Depending on decisions by the U.S. Congress, the federal courts, and the USPTO, the laws and regulations governing patents could change in unpredictable ways that could weaken our ability to obtain new patents or to enforce our existing patents and patents that we might obtain in the future.

Obtaining and maintaining our 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 process. There are situations in which noncompliance can result in abandonment or lapse of a patent or patent application, resulting in partial or complete 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. In some cases, our licensors may be responsible for these payments, thereby decreasing our control over compliance with these requirements.

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 registered or unregistered trademarks or trade names may be challenged, infringed, circumvented or declared generic or determined to be infringing other marks. We may not be able to protect our rights to these trademarks and trade names, which we need to build name recognition by potential partners or customers in our markets of interest. At times, competitors may adopt trade names or trademarks similar to ours, thereby impeding our ability to build brand identity and possibly leading to market confusion. In addition, there could be potential trade name or trademark infringement claims brought by owners of other registered trademarks. Over the long term, if we are unable to establish name recognition based on our trademarks and trade names, then we may not be able to compete effectively and our business may be adversely affected.

We may use third-party open source software components in future products, and failure to comply with the terms of the underlying open source software licenses could restrict our ability to sell such products.

While our current products do not contain any software tools licensed by third-party authors under “open source” licenses, we may choose to use open source software in future products. Use and distribution of open source software may entail greater risks than use of third-party commercial software, as open source licensors generally do not provide warranties or other contractual protections regarding infringement claims or the quality of the code. Some open source licenses may contain requirements that we make available source code for modifications or derivative works we create based upon the type of open source software we use. If we combine our proprietary software with open source software in a certain manner, we could, under certain open source

licenses, be required to release the source code of our proprietary software to the public. This would allow our competitors to create similar products with less development effort and time, and ultimately could result in a loss of product sales.

Although we intend to monitor any use of open source software to avoid subjecting our products to conditions we do not intend, the terms of many open source licenses have not been interpreted by U.S. courts, and there is a risk that any such licenses could be construed in a way that could impose unanticipated conditions or restrictions on our ability to commercialize our products. Moreover, we cannot assure investors that our processes for controlling our use of open source software in our products will be effective. If we are held to have breached the terms of an open source software license, we could be required to seek licenses from third parties to continue offering our products on terms that are not economically feasible, to re-engineer our products, to discontinue the sale of our products if re-engineering could not be accomplished on a timely basis, or to make generally available, in source code form, our proprietary code, any of which could adversely affect our business, operating results, and financial condition.

We use third-party software that may be difficult to replace or cause errors or failures of our products that could lead to lost customers or harm to our reputation.

We use software licensed from third parties in our products. In the future, this software may not be available to us on commercially reasonable terms, or at all. Any loss of the right to use any of this software could result in delays in the production of our products until equivalent technology is either developed by us, or, if available, is identified, obtained and integrated, which could harm our business. In addition, any errors or defects in third-party software or other third-party software failures could result in errors or defects or cause our products to fail, which could harm our business and be costly to correct. Many of these providers attempt to impose limitations on their liability for such errors, defects or failures, and, if enforceable, we may have additional liability to our customers or third-party providers that could harm our reputation and increase our operating costs.

We intend to maintain our relationships with third-party software providers and to seek software from such providers that does not contain any errors or defects. Any failure to do so could adversely impact our ability to deliver reliable products to our customers and could harm our results of operations.

Numerous factors may limit any potential competitive advantage provided by our intellectual property rights.

The degree of future protection afforded by our intellectual property rights is uncertain because intellectual property rights have limitations, and may not adequately protect our business, provide a barrier to entry against our competitors or potential competitors, or permit us to maintain our competitive advantage. Moreover, if a third party has intellectual property rights that cover or impact our use of our technology, we may not be able to fully use or extract value from our intellectual property rights. For example:

- others may be able to develop and/or use technology that is similar to our technology or aspects of our technology but that does not cover the claims of any our patents or patents that may issue from our patent applications or those we license;
- we or the licensor of our licensed-in patents might not have been the first to make the inventions disclosed and/or claimed in a pending patent application that we own or license;
- we or the licensor of our licensed-in patents might not have been the first to file patent applications disclosing and/or claiming an invention;
- others may independently develop similar or alternative technologies without infringing our or our licensors' intellectual property rights;
- pending patent applications that we own or license may not lead to issued patents or may not result in the claims that we want (for example, as to the scope of issued claims, if any);

- patents, if issued, that we own or license may not provide us with any competitive advantages, or may be held invalid or unenforceable, as a result of legal challenges by our competitors or other third parties;
- third parties may compete with us in jurisdictions where we do not pursue and obtain patent protection;
- we may not be able to obtain and/or maintain necessary or useful licenses on reasonable terms or at all;
- third parties may assert an ownership interest in our intellectual property and, if successful, such disputes may preclude us from exercising exclusive rights over that intellectual property;
- we may not be able to maintain the confidentiality of our trade secrets or other proprietary information;
- we may not develop or in-license additional proprietary technologies that are patentable; and
- the patents or other intellectual property of others may have an adverse effect on our business.

Should any of these events occur, they could significantly harm our business and results of operations.

Risks Related to This Offering and Ownership of our Securities

We do not know whether an active, liquid and orderly trading market will develop for our securities or what the market price of our securities will be and as a result it may be difficult for you to sell our securities.

Prior to this offering there has been no public market for our securities. Although our securities have been approved for listing on The Nasdaq Stock Market LLC, or Nasdaq, an active trading market for our securities may never develop or be sustained following this offering. You may not be able to sell your securities quickly or at the market price if trading in our securities is not active. The initial public offering price for our securities will be determined through negotiations with the underwriters, and the negotiated price may not be indicative of the market price of the securities after the offering. As a result of these and other factors, you may be unable to resell our securities at or above the initial public offering price. Further, an inactive market may also impair our ability to raise capital by selling our securities and may impair our ability to enter into strategic partnerships or acquire companies or products by using our securities as consideration.

The price of our securities may be volatile, and you could lose all or part of your investment.

The trading price of our securities following this offering is likely to be highly volatile and could be subject to wide fluctuations in response to various factors, some of which are beyond our control, including limited trading volume. In addition to the factors discussed in this "Risk Factors" section and elsewhere in this prospectus, these factors include:

- our commercial progress in marketing and selling our systems, including sales and revenue trends;
- changes in laws or regulations applicable our systems;
- adverse developments related to our laboratory facilities;
- increased competition in the diagnostics services industry;
- the failure to obtain and/or maintain adequate reimbursement of our systems;
- adverse developments concerning our manufacturers and suppliers;
- our inability to establish future collaborations;
- additions or departures of key scientific or management personnel;

- introduction of new testing services offered by us or our competitors;
- announcements of significant acquisitions, strategic partnerships, joint ventures or capital commitments by us or our competitors;
- our ability to effectively manage our growth;
- the size and growth, if any, of our targeted markets;
- actual or anticipated variations in quarterly operating results;
- our cash position;
- our failure to meet the estimates and projections of the investment community or that we may otherwise provide to the public;
- publication of research reports about us or our industry or positive or negative recommendations or withdrawal of research coverage by securities analysts;
- changes in the market valuations of similar companies;
- overall performance of the equity markets;
- issuances of debt or equity securities;
- sales of our securities by us or our stockholders in the future;
- trading volume of our securities;
- changes in accounting practices;
- ineffectiveness of our internal controls;
- disputes or other developments relating to proprietary rights, including our ability to adequately protect our technologies;
- significant lawsuits, including patent or stockholder litigation;
- general political and economic conditions; and
- other events or factors, many of which are beyond our control.

In addition, the stock market in general, and diagnostic and biotechnology companies in particular, have experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of these companies. Broad market and industry factors may negatively affect the market price of our securities, regardless of our actual operating performance. If the market price of our securities after this offering does not exceed the initial public offering price, you may not realize any return on your investment in us and may lose some or all of your investment. In the past, securities class action litigation has often been instituted against companies following periods of volatility in the market price of a company's securities. This type of litigation, if instituted, could result in substantial costs and a diversion of management's attention and resources, which would harm our business, operating results or financial condition.

We have never paid dividends and we do not intend to pay dividends on our capital stock, so any returns on your investment in our securities will be limited to appreciation in the value of our securities.

We have never declared or paid any cash dividend on our capital stock. We currently anticipate that we will retain future earnings for the development, operation and expansion of our business and do not anticipate declaring or paying any cash dividends for the foreseeable future. Any determination to pay dividends in the future will be at the discretion of our board of directors and will depend upon results of operations, financial condition, contractual restrictions, restrictions imposed by applicable law and other factors our board of directors deems relevant. Accordingly, if you purchase securities in this offering, realization of a gain on your investment

will depend on the appreciation of the price of our securities, which may never occur. In addition, our loan and security agreement with Midcap contains a negative covenant which prohibits us from paying dividends without the prior written consent of Midcap.

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

Our executive officers, directors, 5% stockholders and their affiliates held approximately 84.1% of our voting stock as of June 30, 2018, and, upon the closing of this offering, that same group will hold approximately 52.8% of our outstanding voting stock (assuming no exercise of the underwriters' over-allotment option), based upon the number of shares of our common stock outstanding as of June 30, 2018. Therefore, even after this offering, these stockholders will have the ability to influence us through this ownership position. These stockholders may be able to determine all matters requiring stockholder approval. For example, these stockholders may be able to control elections of directors, amendments of our organizational documents, or approval of any merger, sale of assets or other major corporate transaction. This may prevent or discourage unsolicited acquisition proposals or offers for our securities that you may feel are in your best interest as one of our stockholders.

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

The initial public offering price of our units will be substantially higher than the pro forma net tangible book value per share of our common stock forming part of the unit. Therefore, if you purchase units in this offering at an assumed initial public offering price of $6.50 per unit, you will experience immediate dilution of $4.75 per unit, the difference between the price per unit you pay for our units and the pro forma net tangible book value per share forming part of the unit as of June 30, 2018, after giving effect to the issuance of units in this offering. This dilution is due in large part to the fact that our earlier investors paid substantially less than the initial public offering price when they purchased their securities.

In addition, we have issued options and warrants to acquire our capital stock at prices significantly below the initial public offering price. To the extent outstanding options and warrants are ultimately exercised, there will be further dilution to investors purchasing our securities in this offering. In addition, if the underwriters exercise their option to purchase additional units from us or if we issue additional equity securities, you will experience additional dilution.

We are an emerging growth company, and the reduced reporting requirements applicable to emerging growth companies could make our securities less attractive to investors.

We are an emerging growth company, as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act. For as long as we continue to be an emerging growth company, we may take advantage of exemptions from various reporting requirements that are applicable to other public companies that are not emerging growth companies, including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, or the Sarbanes-Oxley Act, reduced disclosure obligations regarding executive compensation in this prospectus and our periodic reports and proxy statements and exemptions from the requirements of holding nonbinding 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 year in which we complete this offering, although circumstances could cause us to lose that status earlier, including if the market value of our common stock held by non-affiliates exceeds $700.0 million as of any June 30 before that time or if we have total annual gross revenue of $1.07 billion or more during any fiscal year before that time, in which cases we would no longer be an emerging growth company as of the following December 31 or, if we issue more than $1.0 billion in non-convertible debt during any three year period before

that time, we would cease to be an emerging growth company immediately. Even after we no longer qualify as an emerging growth company, we may still qualify as a "smaller reporting company" which would allow us to take advantage of many of the same exemptions from disclosure requirements including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act and reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements. We cannot predict if investors will find our securities less attractive because we may rely on these exemptions, which could result in a less active trading market for our securities and increased volatility in the price of our securities.

Under the JOBS Act, emerging growth companies can also delay adopting new or revised accounting standards that have different effective dates for public and private companies until those standards apply to private companies. We have elected to use this extended transition period. As a result of this election, our timeline to comply with these standards will in many cases be delayed as compared to other public companies that are not eligible to take advantage of this election or have not made this election. Therefore, our financial statements may not be comparable to those of companies that comply with the public company effective dates for these standards.

In addition, if we cease to be an emerging growth company, we will no longer be able to use the extended transition period for complying with new or revised accounting standards. As a result, changes in rules of U.S. generally accepted accounting principles or their interpretation, the adoption of new guidance or the application of existing guidance to changes in our business could significantly affect our financial position and results of operations.

If we fail to maintain proper and effective internal controls, our ability to produce accurate financial statements on a timely basis could be impaired.

After the closing of this offering, we will be subject to the reporting requirements of the Securities Exchange Act of 1934, as amended, the Sarbanes-Oxley Act and the rules and regulations of Nasdaq. The Sarbanes-Oxley Act requires, among other things, that we maintain effective disclosure controls and procedures and internal controls over financial reporting. Internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements in accordance with accounting principles generally accepted in the U.S.. Commencing with our fiscal year ending December 31, 2018, we must perform system and process evaluation and testing of our internal controls over financial reporting to allow management to report on the effectiveness of our internal controls over financial reporting in our Form 10-K filing for that year, as required by Section 404 of the Sarbanes-Oxley Act. This will require that we incur substantial additional professional fees and internal costs to expand our accounting and finance functions and that we expend significant management efforts. Prior to this offering, we have never been required to test our internal controls within a specified period, and, as a result, we may experience difficulty in meeting these reporting requirements in a timely manner.

During the evaluation and testing process of our internal controls, if we identify one or more material weaknesses in our internal control over financial reporting, we will be unable to assert that our internal control over financial reporting is effective. We cannot assure you that there will not be material weaknesses or significant deficiencies in our internal control over financial reporting in the future. Any failure to maintain internal control over financial reporting could severely inhibit our ability to accurately report our financial condition or results of operations. If we are unable to conclude that our internal control over financial reporting is effective, or if our independent registered public accounting firm determines we have a material weakness or significant deficiency in our internal control over financial reporting, we could lose investor confidence in the accuracy and completeness of our financial reports, the market price of our securities could decline, and we could be subject to sanctions or investigations by Nasdaq, the Securities and Exchange Commission, or the SEC, or other regulatory authorities. Failure to remedy any material weakness in our internal control over financial reporting, or to implement or maintain other effective control systems required of public companies, could also restrict our future access to the capital markets.

We will incur significant increased costs as a result of operating as a public company, and our management will be required to devote substantial time to new compliance initiatives.

As a public company, we will incur significant legal, accounting and other expenses that we did not incur as a private company. We will be subject to the reporting requirements of the Securities Exchange Act of 1934, as amended, which will require, among other things, that we file with the SEC annual, quarterly and current reports with respect to our business and financial condition. In addition, the Sarbanes-Oxley Act, as well as rules subsequently adopted by the SEC and Nasdaq to implement provisions of the Sarbanes-Oxley Act, impose significant requirements on public companies, including requiring establishment and maintenance of effective disclosure and financial controls and changes in corporate governance practices. Further, in July 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act, or the Dodd-Frank Act, was enacted. There are significant corporate governance and executive-compensation-related provisions in the Dodd-Frank Act that require the SEC to adopt additional rules and regulations in these areas. Recent legislation permits emerging growth companies to implement many of these requirements over a longer period and up to five years from the pricing of this offering. We intend to take advantage of this new legislation, but cannot assure you that we will not be required to implement these requirements sooner than planned and thereby incur unexpected expenses. Stockholder activism, the current political environment and the current high level of government intervention and regulatory reform may lead to substantial new regulations and disclosure obligations, which may lead to additional compliance costs and impact the manner in which we operate our business in ways we cannot currently anticipate.

We expect the rules and regulations applicable to public companies to substantially increase our legal and financial compliance costs and to make some activities more time-consuming and costly. If these requirements divert the attention of our management and personnel from other business concerns, they could have a material adverse effect on our business, financial condition and results of operations. The increased costs will decrease our net income or increase our consolidated net loss, and may require us to reduce costs in other areas of our business or increase the prices of our products or services. For example, we expect these rules and regulations to make it more difficult and more expensive for us to obtain director and officer liability insurance and we may be required to incur substantial costs to maintain the same or similar coverage. We cannot predict or estimate the amount or timing of additional costs we may incur to respond to these requirements. The impact of these requirements could also make it more difficult for us to attract and retain qualified persons to serve on our board of directors, our board committees or as executive officers.

Sales of a substantial number of shares of our common stock by our existing stockholders in the public market could cause our stock price to fall.

If our existing stockholders sell, or indicate an intention to sell, substantial amounts of our common stock in the public market after the lock-up and other legal restrictions on resale discussed in this prospectus lapse, the trading price of our securities could decline. Based on shares of common stock outstanding as of June 30, 2018, upon the closing of this offering we will have outstanding a total of 8,396,637 shares of common stock (including shares of common stock included in the units but excluding shares underlying the warrants included in the units). Of these shares, only the shares of common stock forming part of the unit sold in this offering by us, plus any shares of common stock forming part of the unit sold upon exercise of the underwriters' over-allotment option, will be freely tradable without restriction in the public market immediately following this offering (except for any shares purchased by our affiliates). Roth Capital Partners, however, may, in its discretion, permit our officers, directors and other stockholders who are subject to these lock-up agreements to sell shares prior to the expiration of the lock-up agreements.

We expect that the lock-up agreements pertaining to this offering will expire 180 days from the date of this prospectus. After the lock-up agreements expire, up to an additional 5,946,637 shares of common stock will be eligible for sale in the public market, though such shares held by directors, executive officers and other affiliates and may be subject to volume limitations under Rule 144 under the Securities Act. In addition, shares of common stock that are either subject to outstanding options or reserved for future issuance under our employee benefit

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 and Rule 144 and Rule 701 under the Securities Act. If these additional shares of common stock are sold, or if it is perceived that they will be sold, in the public market, the trading price of our securities could decline.

After this offering, the holders of 3,801,704 shares of our common stock will be entitled to rights with respect to the registration of their shares under the Securities Act, subject to the lock-up agreements described above. See "Description of Securities—Registration Rights." Registration of these shares under the Securities Act would result in the shares becoming freely tradable without restriction under the Securities Act. Any sales of securities by these stockholders could have a material adverse effect on the trading price of our securities.

Future sales and issuances of our securities or rights to purchase securities, including pursuant to our equity incentive plans, could result in additional dilution to our stockholders and could cause our stock price to fall.

Sales of a substantial number of securities in the public market following the completion of this offering, or the perception that these sales might occur, could depress the market price of our securities and could impair our ability to raise capital through the sale of additional equity securities. We are unable to predict the effect that such sales may have on the prevailing market price of our securities.

All of our executive officers, senior management and directors and all of the holders of our capital stock are subject to lock-up agreements that restrict their ability to transfer shares of our capital stock for 180 days from the date of this prospectus. Subject to certain exceptions, the lock-up agreements limit the number of shares of capital stock that may be sold immediately following this initial public offering. We expect that the lock-up agreements pertaining to this offering will expire 180 days from the date of this prospectus. After the lock-up agreements expire, up to an additional 5,946,637 shares of common stock will be eligible for sale in the public market, of which 3,801,704 shares are held by directors, executive officers and other affiliates and will be subject to volume limitations under Rule 144 under the Securities Act of 1933, as amended, or the Securities Act. In addition, shares of common stock that are either subject to outstanding options or reserved for future issuance under our employee benefit 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 and Rule 144 and Rule 701 under the Securities Act. If these additional shares of common stock are sold, or if it is perceived that they will be sold, in the public market, the trading price of our securities could decline. The underwriters of this offering may, in their sole discretion, permit our stockholders who are subject to these lock-up agreements to sell shares of common stock prior to the expiration of the lock-up agreements.

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

Our management will have broad discretion in the application of the net proceeds from this offering, including for any of the purposes described in the section entitled "Use of Proceeds," and you will not have the opportunity as part of your investment decision to assess whether the net proceeds will be used appropriately. Because of the number and variability of factors that will determine our use of the net proceeds from this offering, their ultimate use may vary substantially from their currently intended use. Our management might not apply our net proceeds in ways that ultimately increase the value of your investment. We intend to use the net proceeds from this offering to expand our commercial capabilities in selling and marketing related to our products, to fund our ongoing research and development activities, and for general corporate purposes, including working capital, operating expenses and capital expenditures.

Our expected use of net proceeds from this offering represents our current intentions based upon our present plans and business condition. As of the date of this prospectus, we cannot predict with certainty all of the particular uses for the net proceeds to be received upon the completion of this offering, or the amounts that we will actually spend on the uses set forth above. The amounts and timing of our actual use of the net proceeds will

vary depending on numerous factors, including the commercial success of our systems and the costs of our research and development activities, as well as the amount of cash used in our operations. The costs and timing of research and development activities and the build out of our commercial selling and marketing capabilities, particularly as related to expansion of our systems, are highly uncertain, subject to substantial risks and can often change. Depending on the outcome of these activities, our plans and priorities may change, and we may apply the net proceeds from this offering differently than we currently anticipate. For example, in the event we identify other opportunities that we believe are in the best interests of our stockholders, we may use a portion of the net proceeds from this offering for the acquisition of, or investment in, technologies, products or companies that complement our business, although we have no current intentions, commitments or agreements to do so. As a result, our management will have broad discretion in the application of the net proceeds, and investors will be relying on our judgment regarding the application of the net proceeds of this offering. In addition, we might decide to postpone or not pursue expansion of our systems if the net proceeds from this offering and other sources of cash are less than expected.

The failure by our management to apply these funds effectively could harm our business. Pending their use, we may invest the net proceeds from this offering in short-term, investment-grade, interest-bearing securities. These investments may not yield a favorable return to our stockholders. If we do not invest or apply the net proceeds from this offering in ways that enhance stockholder value, we may fail to achieve expected financial results, which could cause our stock price to decline.

Anti-takeover provisions under our charter documents and Delaware law could delay or prevent a change of control which could limit the market price of our securities and may prevent or frustrate attempts by our securityholders to replace or remove our current management.

Our amended and restated certificate of incorporation and amended and restated bylaws, which are to become effective immediately prior to the closing of this offering, contain provisions that could delay or prevent a change of control of our company or changes in our board of directors that our stockholders might consider favorable. Some of these provisions include:

- a board of directors divided into three classes serving staggered three-year terms, such that not all members of the board will be elected at one time;
- a prohibition on stockholder action through written consent, which requires that all stockholder actions be taken at a meeting of our stockholders;
- a requirement that special meetings of stockholders be called only by the chairman of the board of directors, the chief executive officer, the president or by a majority of the total number of authorized directors;
- advance notice requirements for stockholder proposals and nominations for election to our board of directors;
- a requirement 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 all outstanding shares of our voting stock then entitled to vote in the election of directors;
- a requirement of approval of not less than two-thirds of all outstanding shares of our voting stock to amend any bylaws by stockholder action or to amend specific provisions of our certificate of incorporation; and
- the authority of the board of directors to issue preferred stock on terms determined by the board of directors without stockholder approval and which preferred stock may include rights superior to the rights of the holders of common stock.

In addition, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporate Law, which may prohibit certain business combinations with stockholders

owning 15% or more of our outstanding voting stock. These anti-takeover provisions and other provisions in our amended and restated certificate of incorporation and amended and restated bylaws could make it more difficult for stockholders or potential acquirers to obtain control of our board of directors or initiate actions that are opposed by the then-current board of directors and could also delay or impede a merger, tender offer or proxy contest involving our company. These provisions could also discourage proxy contests and make it more difficult for you and other stockholders to elect directors of your choosing or cause us to take other corporate actions you desire. Any delay or prevention of a change of control transaction or changes in our board of directors could cause the market price of our securities to decline.

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

The trading market for our securities will depend in part on the research and reports that securities or industry analysts publish about us or our business. Securities and industry analysts do not currently, and may never, publish research on our company. If no securities or industry analysts commence coverage of our company, the trading price for our securities would likely be negatively impacted. In the event securities or industry analysts initiate coverage, if one or more of the analysts who covers us downgrades our securities or publishes inaccurate or unfavorable research about our business, the price of our securities may decline. If one or more of these analysts ceases coverage of our company or fails to publish reports on us regularly, demand for our securities could decrease, which might cause the price of our securities and trading volume to decline.

Our recurring losses and negative cash flows have raised substantial doubt regarding our ability to continue as a going concern.

Since inception, we have experienced recurring operating losses and negative cash flows, and we expect to continue to generate operating losses and consume significant cash resources for the foreseeable future. Without additional financing, these conditions raise substantial doubt about our ability to continue as a going concern, meaning that we may be unable to continue operations for the foreseeable future or realize assets and discharge liabilities in the ordinary course of operations. As a result, our financial statements include an explanatory paragraph expressing substantial doubt about our ability to continue as a going concern. If we are unable to obtain sufficient funding, our business, prospects, financial condition and results of operations will be materially and adversely affected and we may be unable to continue as a going concern. If we are unable to continue as a going concern, we may have to liquidate our assets and may receive less than the value at which those assets are carried on our consolidated financial statements, and it is likely that investors will lose all or a part of their investment. Future reports from our independent registered public accounting firm may also contain statements expressing doubt about our ability to continue as a going concern. If we seek additional financing to fund our business activities in the future and there remains doubt about our ability to continue as a going concern, investors or other financing sources may be unwilling to provide additional funding on commercially reasonable terms or at all.

Our amended and restated certificate of incorporation to be effective in connection with the closing of this offering will provide that the Court of Chancery of the State of Delaware or the U.S. federal district courts 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 other employees.

Our amended and restated certificate of incorporation to be effective in connection with the closing of this offering provides that the Court of Chancery of the State of Delaware is the sole and exclusive forum for 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, or any action asserting a claim against us that is governed by the internal affairs doctrine. Our amended and restated certificate of incorporation further provides

that the U.S. federal district courts will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act. These choice of 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 such lawsuits. If a court were to find either choice of forum provision contained in our amended and restated certificate of incorporation to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving such action in other jurisdictions, which could adversely affect our results of operations and financial condition.

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 or financial condition, business strategy and plans, and objectives of management for future operations, 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.

We have based these forward-looking statements largely on our current expectations and projections about future events and financial trends that we believe may affect our financial condition, results of operations, business strategy and financial needs. These forward-looking statements are subject to known and unknown risks, uncertainties and assumptions, including risks described in "Risk Factors" and elsewhere in this prospectus, regarding, among other things:

- the size and growth potential of the markets for our products, and our ability to serve those markets;
- the rate and degree of market acceptance of our products;
- ability to expand our sales organization to address effectively existing and new markets that we intend to target;
- impact from future regulatory, judicial, and legislative changes or developments in the U.S. and foreign countries;
- ability to compete effectively in a competitive industry;
- the success of competing technologies that are or may become available;
- the performance of our third-party contract sales organizations, suppliers and manufacturers;
- our ability to attract and retain key scientific or management personnel;
- the accuracy of our estimates regarding expenses, future revenues, reimbursement rates, capital requirements and needs for additional financing;
- our ability to obtain funding for our operations;
- our ability to attract collaborators and strategic partnerships; and
- our use of the 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, results of operations and prospects. The outcome of the events described in these forward-looking statements is subject to risks, uncertainties and other factors described in "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. And 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, including market size and growth rates of the markets in which we participate, that are based on industry publications and reports. This information involves many assumptions and limitations, and you are cautioned not to give undue weight to these estimates. We have not independently verified the accuracy or completeness of the data contained in these industry publications and reports. The industry in which we operate is subject to a high degree of uncertainty and risk due to a variety of factors, including those described in “Risk Factors,” that could cause results to differ materially from those expressed in these publications and reports.

USE OF PROCEEDS

We estimate that we will receive net proceeds from this offering of approximately $13.0 million (or approximately $15.2 million if the underwriters' option to purchase additional units from us is exercised in full) based on the assumed initial public offering price of $6.50 per unit, 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 $6.50 per unit would increase (decrease) cash and cash equivalents, working capital, total assets, total liabilities, additional paid-in capital and total stockholders' (deficit) equity by $2.3 million, assuming that the number of units offered by us, as set forth on the cover page of this prospectus, remains the same, after deducting the estimated underwriting discounts and commissions. Similarly, each increase (decrease) of 1.0 million units offered by us would increase (decrease) each of cash and cash equivalents, working capital, total assets, additional paid-in capital and total stockholders' (deficit) equity by $6.0 million, assuming the assumed initial public offering price of $6.50 per unit remains the same, and after deducting the estimated underwriting discounts and commissions.

We intend to use the net proceeds from the offering as follows: (1) $8.0 million to expand our commercial operations to grow and support the installed base of our products among life sciences basic research, translational research and clinical-related customers in the U.S. and internationally; (2) $3.0 million to improve and update our technology and instruments and to develop additional labeling reagents; (3) $0.5 million to potentially establish a direct commercialization presence in China; (4) $0.5 million to assist existing and future partners in pursuing regulatory approvals or clearances to develop instruments and consumables in areas outside of life science research, including potentially LDTs; and (5) the remainder to fund working capital and other general corporate purposes.

We also may use a portion of the net proceeds from the offering to fund acquisitions or other business development opportunities. However, we have no current commitments or obligations with respect to any such acquisitions or business development opportunities at this time.

The expected use of net proceeds from this offering represents our intentions based upon our present plans and business conditions. We cannot predict with certainty all of the particular uses for the proceeds of this offering or the amounts that we will actually spend on the uses set forth above. Accordingly, we will have significant flexibility in applying the net proceeds of this offering. The timing and amount of our actual expenditures will be based on many factors, including cash flows from operations and the anticipated growth of our business. Pending their use, we intend to invest the net proceeds of 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 do not anticipate declaring or paying, in the foreseeable future, any cash dividends on our capital stock. We 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, if any, 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 are currently prohibited from paying dividends on our common stock without the prior written consent of Midcap, our senior lender.

CAPITALIZATION

The following table sets forth our cash and cash equivalents and capitalization as of June 30, 2018:

- on an actual basis;
- on a pro forma basis, giving effect to (i) the automatic conversion of all of our outstanding shares of convertible preferred stock into an aggregate of 2,850,280 shares of common stock, (ii) the conversion of approximately $14.4 million aggregate principal amount of outstanding convertible promissory notes plus accrued interest thereon into 3,018,312 shares of common stock (based on an assumed initial public offering price of $6.50 per unit (the midpoint of the price range set forth on the cover page of this prospectus) and a conversion date of June 30, 2018); and
- on a pro forma as adjusted basis, giving effect to (i) the pro forma adjustments set forth above and (ii) our receipt of estimated net proceeds from the sale of 2,450,000 units in the offering at the assumed initial public offering price of $6.50 per unit, after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us.

You should read this table together with "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our financial statements and related notes included elsewhere in this prospectus.

	As of June 30, 2018		
	Actual	Pro Forma	Pro Forma As Adjusted
		(unaudited)	
Cash and cash equivalents	$ 7,624,289	$ 7,624,289	$ 20,619,039
Long-term debt	8,956,143	8,956,143	8,956,143
Convertible note	14,329,843	—	—
Preferred stock warrant liability	1,604,836	—	—
Convertible preferred stock, $0.0001 par value; 218,982,477 shares authorized, 121,992,497 shares issued and outstanding, actual, and no shares authorized, issued and outstanding, pro forma and pro forma as adjusted	43,010,137	—	—
Stockholders' deficit:			
Common stock, $0.0001 par value; 244,097,620 shares authorized, actual, 78,045 shares issued and outstanding, actual; 244,097,620 shares authorized, pro forma; 5,946,637 shares issued and outstanding, pro forma; 244,097,620 shares authorized, pro forma as adjusted; 8,396,637 shares issued and outstanding, pro forma as adjusted	8	595	840
Additional paid-in capital	4,147,255	63,091,484	76,085,989
Accumulated deficit	(61,424,874)	(61,424,874)	(61,424,874)
Total stockholders' (deficit) equity	(57,277,611)	1,667,205	14,661,955
Total capitalization	$ 10,623,348	$ 10,623,348	$ 23,618,098

A $1.00 increase (decrease) in the assumed initial public offering price of $6.50 per unit would increase (decrease) cash and cash equivalents, working capital, total assets, total liabilities, additional paid-in capital and total stockholders' (deficit) equity by $2.3 million, assuming that the number of units offered by us, as set forth on the cover page of this prospectus, remains the same, after deducting the estimated underwriting discounts and commissions. Similarly, each increase (decrease) of 1.0 million units offered by us would increase (decrease) each of cash and cash equivalents, working capital, total assets, additional paid-in capital and total stockholders'

(deficit) equity by $6.0 million, assuming the assumed initial public offering price of $6.50 per unit remains the same, and after deducting the estimated underwriting discounts and commissions.

If the underwriters' option to purchase additional units from us is exercised in full, pro forma as adjusted cash and cash equivalents, additional paid-in capital, total stockholders' (deficit) equity, total capitalization and shares of common stock outstanding as of June 30, 2018 would be $22.8M, $78.3M, $16.9M, $25.8M and 8.8M, respectively.

The number of shares of our common stock to be outstanding after this offering is based on 2,928,325 shares of our common stock as of June 30, 2018, after giving effect to the conversion of shares of our convertible preferred stock outstanding as of June 30, 2018 into an aggregate of 2,850,280 shares of our common stock immediately prior to the closing of this offering, and excludes:

- 416,937 shares of our common stock issuable upon the exercise of stock options outstanding as of June 30, 2018 under our Amended and Restated 2006 Equity Compensation Plan, as amended, or 2006 Plan, with a weighted-average exercise price of $5.05 per share;
- 1,499,454 shares of our common stock reserved for future issuance under our 2018 Equity Incentive Plan, or 2018 Plan, which will become effective once the registration statement of which this prospectus forms a part is declared effective, with such shares including 1,000,000 new shares plus the number of shares (not to exceed 499,454 shares) (i) that remain available for the issuance of awards under our 2006 Plan at the time our 2018 Plan becomes effective, and (ii) any shares underlying outstanding stock awards granted under our 2006 Plan that expire or are repurchased, forfeited, cancelled or withheld, as more fully described in the section titled "Executive Compensation – Equity Incentive Plans";
- 175,000 shares of our common stock reserved for issuance under our 2018 Employee Stock Purchase Plan, or ESPP, which will become effective once the registration statement of which this prospectus forms a part is declared effective, and any automatic increases in the number of shares of common stock reserved for future issuance under our ESPP;
- 1,001 shares of our common stock issuable upon the exercise of an outstanding warrant which, prior to the completion of this offering, is exercisable for 42,872 shares of our Series B convertible preferred stock;
- 1,752 shares of our common stock issuable upon the exercise of outstanding warrants which, prior to the completion of this offering, are exercisable for 75,027 shares of our Series B-1 convertible preferred stock;
- 11,925 shares of our common stock issuable upon the exercise of an outstanding warrant which, prior to the completion of this offering, is exercisable for 510,417 shares of our Series D convertible preferred stock;
- 21,416 shares of our common stock issuable upon the exercise of an outstanding warrants which, prior to the completion of this offering, are exercisable for 916,667 shares of our Series D-1 convertible preferred stock; and
- up to 84,525 shares of common stock issuable upon exercise of warrants to be issued to the Underwriters in connection with this offering, which will have an exercise price per share equal to 150% of the initial public offering price per unit in this offering.

Unless we specifically state otherwise, the information in this prospectus assumes or gives effect to:

- the filing of our amended and restated certificate of incorporation, which will be in effect upon the completion of this offering;
- the conversion of all of our outstanding shares of convertible preferred stock into an aggregate of 2,850,280 shares of common stock upon the closing of this offering;

- the conversion of outstanding convertible promissory notes into 3,018,312 shares of common stock (based on an assumed initial public offering price of $6.50 per unit (the midpoint of the price range set forth on the cover page of this prospectus) and a conversion date of June 30, 2018);
- that the initial public offering price of our shares of common stock is $6.50 per unit, which is the midpoint of the price range set forth on the cover page of this prospectus;
- no exercise of the outstanding options described above;
- no exercise of the underwriters' option to purchase up to an additional 367,500 units from us in this offering; and
- a 1-for-21.4 reverse stock split of our common stock effected on July 16, 2018 and a subsequent 1-for-2 reverse stock split of our common stock effected on August 15, 2018.

DILUTION

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

Our pro forma net tangible book value as of June 30, 2018 was $1.7 million, or $0.28 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 our shares of common stock outstanding as of June 30, 2018, after giving effect to (i) the automatic conversion of all of our outstanding shares of convertible preferred stock into an aggregate of 2,850,280 shares of common stock, and (ii) the conversion of approximately $14.4 million aggregate principal amount of outstanding convertible promissory notes plus accrued interest thereon into 3,018,312 shares of common stock (based on an assumed initial public offering price of $6.50 per unit (the midpoint of the price range set forth on the cover page of this prospectus) and a conversion date of June 30, 2018).

After giving effect to the sale by us of 2,450,000 units in this offering at the assumed initial public offering price of $6.50 per unit (the mid-point of the price range set forth on the cover page of this prospectus), and after deducting estimated underwriting discounts, commissions and estimated offering expenses payable by us, our pro forma as adjusted net tangible book value as of June 30, 2018 would have been $14.7 million, or $1.75 per share. This amount represents an immediate increase in pro forma as adjusted net tangible book value of $1.47 per share to our existing stockholders and an immediate dilution in pro forma as adjusted net tangible book value of $4.75 per unit to investors purchasing units in this offering. We determine dilution by subtracting the pro forma as adjusted net tangible book value per share after this offering from the amount of cash paid by an investor for a unit in this offering. The following table illustrates this dilution on a per share basis:

Assumed initial public offering price per unit		$6.50
Historical net tangible book value (deficit) per share as of June 30, 2018	$(733.90)	
Increase in historical net tangible book value (deficit) per share attributable to pro forma adjustments described above	$ 734.18	
Pro forma net tangible book value (deficit) per share as of June 30, 2018	$ 0.28	
Increase in pro forma as adjusted net tangible book value per share attributable to new investors purchasing units in this offering	$ 1.47	
Pro forma as adjusted net tangible book value per share after this offering		$1.75
Dilution per unit to new investors purchasing units in this offering		$4.75

The dilution information discussed above is illustrative only and may change based on the actual initial public offering price and other terms of this offering. A $1.00 increase (decrease) in the assumed initial public offering price of $6.50 per unit would increase (decrease) our pro forma as adjusted net tangible book value per share after this offering by $0.27 per share and increase (decrease) the dilution to investors purchasing units in this offering by $0.73 per unit, in each case assuming the number of units offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions payable by us. Similarly, each increase or decrease of 1.0 million units offered by us would increase (decrease) our pro forma as adjusted net tangible book value by approximately $0.46 per share and decrease (increase) the dilution to investors purchasing units in this offering by approximately $0.46 per unit, in each case assuming the assumed initial public offering price of $6.50 per unit remains the same, and after deducting estimated underwriting discounts and commissions.

If the underwriters exercise their option to purchase additional units in full, the pro forma net tangible book value per share, as adjusted to give effect to this offering, would be $0.18 per share, and the dilution in pro forma net tangible book value per unit to investors in this offering would be $0.18 per unit.

The number of shares of our common stock to be outstanding after this offering is based on 2,928,325 shares of our common stock as of June 30, 2018, after giving effect to the conversion of shares of our convertible preferred stock outstanding as of June 30, 2018 into an aggregate of 2,850,280 shares of our common stock immediately prior to the closing of this offering, and excludes:

- 416,937 shares of our common stock issuable upon the exercise of stock options outstanding as of June 30, 2018 under our 2006 Plan with a weighted-average exercise price of $5.05 per share;
- 1,499,454 shares of our common stock reserved for future issuance under the 2018 Plan, which will become effective once the registration statement of which this prospectus forms a part is declared effective, with such shares including 1,000,000 new shares plus the number of shares (not to exceed 499,454 shares) (i) that remain available for the issuance of awards under our 2006 Plan at the time our 2018 Plan becomes effective, and (ii) any shares underlying outstanding stock awards granted under our 2006 Plan that expire or are repurchased, forfeited, cancelled or withheld, as more fully described in the section titled “Executive Compensation – Equity Incentive Plans”;
- 175,000 shares of our common stock reserved for issuance under the ESPP, which will become effective once the registration statement of which this prospectus forms a part is declared effective, and any automatic increases in the number of shares of common stock reserved for future issuance under our ESPP;
- 1,001 shares of our common stock issuable upon the exercise of an outstanding warrant which, prior to the completion of this offering, is exercisable for 42,872 shares of our Series B convertible preferred stock;
- 1,752 shares of our common stock issuable upon the exercise of outstanding warrants which, prior to the completion of this offering, are exercisable for 75,027 shares of our Series B-1 convertible preferred stock;
- 11,925 shares of our common stock issuable upon the exercise of an outstanding warrant which, prior to the completion of this offering, is exercisable for 510,417 shares of our Series D convertible preferred stock;
- 21,416 shares of our common stock issuable upon the exercise of an outstanding warrants which, prior to the completion of this offering, are exercisable for 916,667 shares of our Series D-1 convertible preferred stock; and
- up to 84,525 shares of common stock issuable upon exercise of warrants to be issued to the Underwriters in connection with this offering, which will have an exercise price per share equal to 150% of the initial public offering price per unit in this offering.

To the extent that any outstanding options or warrants are exercised or new options are issued under our stock-based compensation plans, or we issue additional shares of common stock in the future, there will be further dilution to investors participating in this offering. In addition, we may choose to raise additional capital because of market conditions or strategic considerations, even if we believe that we have sufficient funds for our current or future operating plans. If we raise additional capital through the sale of equity or convertible debt securities, the issuance of these securities could result in further dilution to our stockholders.

Certain of our existing stockholders, including entities affiliated with them or with certain of our directors, have indicated an interest in purchasing an aggregate of approximately $8.0 million in units in this offering at the initial public offering price per unit. Based on an assumed initial public offering price of $6.50 per unit, these persons and entities would purchase an aggregate of approximately 1,230,770 of the 2,450,000 units in this offering based on these indications of interest. However, because indications of interest are not binding agreements or commitments to purchase, the underwriters may determine to sell more, less or no units in this offering to any of these persons or entities, or any of these persons or entities may determine to purchase more, less or no units in this offering. The foregoing discussion and tables do not reflect any potential purchases by these persons or entities or their affiliated entities.

SELECTED FINANCIAL DATA

The selected statements of operations data for the years ended December 31, 2016 and 2017 and the balance sheet data as of December 31, 2016 and 2017 are derived from our audited financial statements that are included elsewhere in this prospectus. The selected statements of operations data for the six months ended June 30, 2017 and 2018 and the balance sheet data as of June 30, 2018 are derived from our unaudited financial statements that are included elsewhere in this prospectus. Our historical results are not necessarily indicative of our results in any future period and results from our interim period may not necessarily be indicative of the results of the entire year.

You should read the following selected financial data together with "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our financial statements and the related notes included elsewhere in this prospectus. The selected financial data in this section are not intended to replace our financial statements and the related notes and are qualified in their entirety by the financial statements and related notes included elsewhere in this prospectus.

	Year ended December 31,		Six Months Ended June 30,	
	2016	2017	2017	2018
			(unaudited)	
Total revenue	$ 6,792,789	$ 9,505,043	$ 3,916,864	$ 5,158,494
Operating expenses				
Cost of revenue	3,578,692	6,030,512	2,844,117	2,654,879
Research and development	11,431,941	12,009,170	6,584,614	4,465,919
Selling, general and administrative	12,950,572	14,079,658	7,436,426	6,385,378
Impairment of property and equipment	—	604,511	—	—
Total operating expenses	27,961,205	32,723,851	16,865,157	13,506,176
Interest expense	(470,072)	(590,927)	(286,095)	(709,616)
Other income	2,802,797	462,923	896,758	1,907,742
Provision for income taxes	(12,924)	(18,552)	(22,358)	(9,282)
Net loss	$ (18,848,615)	$ (23,365,364)	$ (12,359,988)	$ (7,158,838)
Net loss per share[1]:				
Basic and diluted	$ (312.46)	$ (327.78)	$ (176.12)	$ (92.23)
Pro forma net loss per share[1]:				
Basic and diluted		$ (8.65)		$ (1.40)

(1) See Note 2 of the notes to our financial statements included elsewhere in this prospectus for a description of how we compute basic and diluted net income per share attributable to common stockholders and preferred stockholders and pro forma basic and diluted net loss per share attributable to common stockholders.

	Year Ended December 31		As of June 30
	2016	2017	2018
			(unaudited)
Balance Sheet Data:			
Cash and cash equivalents	$ 5,249,620	$ 1,021,897	$ 7,624,289
Working capital	1,371,819	(9,512,886)	(6,773,417)
Total assets	14,787,737	10,145,153	18,094,156
Convertible note	—	—	14,329,843
Long-term debt	6,633,176	6,729,752	8,956,143
Total liabilities	16,630,182	17,362,227	32,361,630
Convertible preferred stock	25,416,527	43,010,137	43,010,137
Accumulated deficit	(30,900,672)	(54,266,036)	(61,424,874)
Total stockholders' (deficit) equity	(27,258,972)	(50,227,211)	(57,277,611)

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

The following discussion should be read in conjunction with the "Selected Financial Data" and our financial statements and related notes thereto included elsewhere in this prospectus. In addition to historical information, this discussion contains forward- looking statements that involve risks, uncertainties and assumptions that could cause actual results to differ materially from management's expectations. Factors that could cause such differences are discussed in the sections entitled "Special Note Regarding Forward-Looking Statements" and "Risk Factors." We are not undertaking any obligation to update any forward-looking statements or other statements we may make in the following discussion or elsewhere in this document even though these statements may be affected by events or circumstances occurring after the forward-looking statements or other statements were made. Therefore, no reader of this document should rely on these statements being current as of any time other than the time at which this document is declared effective by the U.S. Securities and Exchange Commission.

Overview

We are a life sciences instrumentation company in the genome analysis space. We develop and market the Saphyr system, a platform for ultra-sensitive and ultra-specific structural variation detection that enables researchers and clinicians to accelerate the search for new diagnostics and therapeutic targets and to streamline the study of changes in chromosomes, which is known as cytogenetics. Our Saphyr system comprises an instrument, chip consumables, reagents and a suite of data analysis tools.

Structural variation refers to large-scale structural differences in the genomic DNA of one individual compared to another. Each structural variation involves the rearrangement or repetition of as few as hundreds to as many as tens of millions of DNA base pairs. Those rearrangements may be insertions, deletions, duplications, inversions or translocations of segments of one or more chromosomes. Structural variations may be inherited or arise spontaneously and many cause genetic disorders and diseases. Until our commercial launch of the Saphyr system in February 2017, and since, we believe no products existed or exist that could more comprehensively and cost and time-efficiently detect structural variation.

Our Saphyr system comprises an instrument, chip consumables, reagents and a suite of data analysis tools. Our customers include researchers and clinicians who seek to uncover and understand the biological or clinical impact of genome variation to improve the diagnosis and treatment of patients with better clinical tests and new medicines or to replace existing cytogenetic tests that are expensive, slow and labor-intense, with a modern solution that simplifies workflow and reduces costs and that has the potential to significantly increase diagnostic yields across the industry. Our customers also include researchers in non-human segments such as agricultural genomics where they seek to advance their understanding of how structural variation impacts industrial applications of plants and animals.

To date, we have financed our operations principally through private placements of our convertible preferred stock, convertible promissory notes, borrowings from credit facilities and revenue from our commercial operations.

Since our inception, we have raised net equity proceeds of $129.3 million to fund our operations from the issuance of convertible preferred stock and convertible promissory notes. We have incurred losses in each year since our inception. Our net losses were $18.8 million and $23.4 million for the years ended December 31, 2016 and 2017, respectively, and $12.4 million and $7.2 million for the six months ended June 30, 2017 and 2018, respectively. As of June 30, 2018, we had an accumulated deficit of $61.4 million.

We expect to continue to incur significant expenses and operating losses as we:

- expand our sales and marketing efforts to further commercialize our products;

- continue research and development efforts to improve our existing products;
- hire additional personnel;
- enter into collaboration arrangements, if any;
- add operational, financial and management information systems; and
- incur increased costs as a result of operating as a public company.

Financial Overview

Revenue

We generate product revenue from sales of our instruments and consumables. We currently sell our products for research use only applications and our customers are primarily laboratories associated with academic and governmental research institutions, as well as pharmaceutical, biotechnology and contract research companies. Sales of our consumables have consistently increased due to an increasing number of our instruments being installed in the field, all of which require certain of our consumables to run customers' specific tests. Consumable revenue consists of sales of complete assays which are developed internally by us, plus sales of kits which contain all the elements necessary to run tests.

Other revenue consists of warranty and other service-based revenue.

The following table presents our revenue for the periods indicated:

	Year Ended December 31,		Six Months Ended June 30,	
	2016	2017	2017	2018
			(unaudited)	
Product revenue	$ 6,153,355	$ 8,769,704	$ 3,609,281	$ 4,918,245
Other revenue	639,434	735,339	307,583	240,249
Total	$ 6,792,789	$ 9,505,043	$ 3,916,864	$ 5,158,494

The following table reflects total revenue by geography and as a percentage of total revenue, based on the billing address of our customers. North America consists of the United States and Canada. EMEIA consists of Europe, Middle East, India and Africa. Asia Pacific includes China, Japan, South Korea, Singapore and Australia.

	Year Ended December 31,				Six Months Ended June 30,			
	2016		2017		2017		2018	
	$	%	$	%	$	%	$	%
					(unaudited)			
North America	$2,078,987	31%	$3,801,481	40%	$1,794,728	47%	$2,553,428	49%
EMEIA	1,666,188	24%	1,282,897	13%	819,464	21%	1,128,510	21%
Asia Pacific	3,047,614	45%	4,420,665	47%	1,302,672	32%	1,476,556	30%
Total	$6,792,789	100%	$9,505,043	100%	$3,916,864	100%	$5,158,494	100%

Subsequent to the issuance of the June 30, 2018 unaudited condensed consolidated financial statements, we discovered an error in the disclosure of revenue amounts for the six months ended June 30, 2018 within the North America, EMEIA and Asia Pacific geographic regions. Accordingly, the table above has been restated to correct the June 30, 2018 disclosures of revenue for the North America, EMEIA and Asia Pacific geographic regions, resulting in increases (decreases) from amounts previously reported of $837,451, $239,421, and $(1,076,872), respectively.

Cost of Revenue

Cost of revenue for our instruments and consumables includes cost from the manufacturer, raw material parts costs and associated freight, shipping and handling costs, contract manufacturer costs, salaries and other personnel costs, overhead and other direct costs related to those sales recognized as product revenue in the period.

Cost of other revenue consists of salaries and other personnel costs and costs related to warranties and other costs of servicing equipment at customer sites.

Research and Development Expenses

Research and development expenses consist of salaries and other personnel costs, stock-based compensation, research supplies, third-party development costs for new products, materials for prototypes, and allocated overhead costs that include facility and other overhead costs. We have made substantial investments in research and development since our inception, and plan to continue to make investments in the future. Our research and development efforts have focused primarily on the tasks required to support development and commercialization of new and existing products. We believe that our continued investment in research and development is essential to our long-term competitive position.

Selling, General and Administrative Expenses

Selling, general and administrative expenses consist primarily of salaries and other personnel costs, and stock-based compensation for our sales and marketing, finance, legal, human resources and general management, as well as professional services, such as legal and accounting services.

Results of Operations

Comparison of the Six Months Ended June 30, 2017 and 2018

The following table sets forth our results of operations for the six months ended June 30, 2017 and 2018:

	Six Months Ended June 30,		Period-to-Period Change	
	2017	2018	$	%
		(unaudited)		
Product revenue	$ 3,609,281	$ 4,918,245	$ 1,308,964	36.3%
Other revenue	307,583	240,249	(67,334)	-21.9%
Total revenue	3,916,864	5,158,494	1,241,630	31.7%
Cost of product revenue	2,818,861	2,644,043	(174,818)	-6.2%
Cost of other revenue	25,256	10,836	(14,420)	-57.1%
Research and development	6,584,614	4,465,919	(2,118,695)	-32.2%
Selling, general and administrative	7,436,426	6,385,378	(1,051,048)	-14.1%
Total operating expenses	16,865,157	13,506,176	(3,358,981)	-19.9%
Loss from operations	(12,948,293)	(8,347,682)	4,600,611	-35.5%
Interest expense	(286,095)	(709,616)	(423,521)	-148.0%
Change in fair value of preferred stock warrants and expirations	953,893	2,470,921	1,517,028	159.0%
Other expense	(57,135)	(563,179)	(506,044)	-885.7%
Loss before income taxes	(12,337,630)	(7,149,556)	5,188,074	-42.1%
Provision for income taxes	(22,358)	(9,282)	13,076	-58.5%
Net loss	$ (12,359,988)	$ (7,158,838)	$ (5,201,150)	-42.1%

Revenue

Revenue increased by $1.2 million, or 31.7%, to $5.2 million for the six months ended June 30, 2018, as compared to $3.9 million for the same period in 2017. Average sales prices, or ASPs, of instruments decreased by 7% while consumables increased by 37%, respectively in the six months ended June 30, 2018, as compared with the six months ended June 30, 2017. We began selling our new Saphyr system in February 2017 which includes higher priced consumables than those sold under our previously marketed, first generation system Irys. In addition, sales volumes of instruments and consumables increased by 17% and 160%, respectively in the six months ended June 30, 2018, as compared with the six months ended June 30, 2017.

Cost of Revenue

Cost of product revenue decreased by $0.2 million, or 6.2%, to $2.6 million for the six months ended June 30, 2018, as compared to $2.8 million for the same period in 2017. The decrease was primarily due to the increase in consumable revenue relative to instrument revenue for the six months ended June 30, 2018, as compared to the same period in 2017. Cost of revenues could adversely be affected if we are unable to sell our remaining Irys instruments at the current carrying amount of $1.3 million.

Research and Development Expenses

Research and development expenses decreased $2.1 million, or $32.2%, to $4.5 million for the six months ended June 30, 2018 compared to $6.6 million for the same period in 2017. The decrease in research and development expenses during this period was primarily related to decreases in compensation and benefit expense as a result in a reduction in headcount during the second half of 2017.

Selling, General and Administrative Expenses

Selling, general and administrative expenses were $7.4 million and $6.4 million for the six months ended June 30, 2017 and 2018, respectively. The decrease in selling, general and administrative expenses during this period of $1.0 million was primarily related to decreases in compensation and benefit expense as a result of a reduction in headcount during the second half of 2017. We expect selling, general and administrative expenses to increase in future periods as the number of sales, technical support and marketing and administrative personnel grows and we continue to broaden our customer base and grow our business. We also expect to incur additional expenses as a public company, including expenses related to compliance with the rules and regulations of the SEC and Nasdaq, additional insurance expenses, and expenses related to investor relations activities and other administrative and professional services.

Interest Expense

Interest expense increased from $0.3 million to $0.7 million for the six months ended June 30, 2017 and 2018, respectively. The increase in interest expense is related to additional borrowing of convertible notes entered into during the six months ended June 30, 2018.

Change in Fair Value of Preferred Stock Warrants

Change in fair value of preferred stock warrants was $1.0 million and $2.5 million for the six months ended June 30, 2017 and 2018, respectively. The preferred stock warrants are subject to remeasurement at each reporting period, with changes in fair value recorded in the statement of operations.

Other Expense

Other expense was $0.1 million and $0.6 million for the six months ended June 30, 2017 and 2018, respectively. The increase is related to financing expenses incurred to extinguish the Western Alliance LSA during the six months ended June 30, 2018.

Comparison of the Years Ended December 31, 2016 and 2017

The following table sets forth our results of operations for the years ended December 31, 2016 and 2017:

	Year Ended December 31,		Period-to-Period Change	
	2016	2017	$	%
Product revenue	$ 6,153,355	$ 8,769,704	$ 2,616,349	42.5%
Other revenue	639,434	735,339	95,905	15.0%
Total revenue	6,792,789	9,505,043	2,712,254	39.9%
Cost of product revenue	3,459,771	5,958,537	2,498,766	72.2%
Cost of other revenue	118,921	71,975	(46,946)	-39.5%
Research and development	11,431,941	12,009,170	577,229	5.0%
Selling, general and administrative	12,950,572	14,079,658	1,129,086	8.7%
Impairment of property and equipment	—	604,511	604,511	N/A
Total operating expenses	27,961,205	32,723,851	4,762,646	17.0%
Loss from operations	(21,168,416)	(23,218,808)	(2,050,392)	9.7%
Interest expense	(470,072)	(590,927)	(120,855)	-25.7%
Change in fair value of preferred stock warrants and expirations	3,006,082	751,933	(2,254,149)	-75.0%
Other expense	(203,285)	(289,010)	(85,725)	-42.2%
Loss before income taxes	(18,835,691)	(23,346,812)	(4,511,121)	23.9%
Provision for income taxes	(12,924)	(18,552)	(5,628)	43.5%
Net loss	$(18,848,615)	$(23,365,364)	$ 4,516,749	24.0%

Revenue

Revenue increased by $2.7 million, or 39.9% to $9.5 million for the year ended December 31, 2017, as compared to $6.8 million for the same period in 2016. ASPs of instruments and consumables increased in the year ended December 31, 2017, as compared with the year ended December 31, 2016 as we began selling our new Saphyr system, which includes higher priced instruments and consumables, in February 2017. The vast majority of the increase in product revenue of $2.6 million was due to a 37% increase in instrument unit sales and a 4% increase in consumable unit sales in the year ended December 31, 2017, as compared to 2016; higher priced instruments (instrument ASP increased 6%) and consumables (consumable ASP increased 18%) also contributed to the increase in product revenue, but to a much lesser extent than the increase in sales volume. The increase in other revenue of $0.1 million was due to increased warranty revenues.

Cost of Revenue

Cost of product revenue increased by $2.5 million, or 72.2%, to $6.0 million for the year ended December 31, 2017, as compared to $3.5 million for the same period in 2016. The increase was primarily due to increased sales of instruments and consumables and write-downs of Irys instruments (the predecessor to our Saphyr instrument) of $0.4 million included in inventory to net realizable value during 2017. During the year ended December 31, 2017, we also incurred higher costs related to the manufacturing of our instruments due to purchase quantities at lower volumes on a per-batch basis. In order to manage working capital, instruments were ordered as needed, limiting volume based purchase discounts. We expect the cost of product revenue per instrument to decrease in future periods as we benefit from economies of scale and modifications to the components and assembly over time. Cost of revenues could adversely be affected if we are unable to sell our remaining Irys instruments at the current carrying amount of $1.3 million.

Research and Development Expenses

Research and development expenses were relatively consistent at $11.4 million and $12.0 million for the year ended December 31, 2016 and 2017, respectively. During 2017, we began to transition our efforts from research and development to the commercialization of our products. As part of commercialization effort we reduced headcount related to research and development personnel during the second half of 2017. We expect our research and development expenses will be lower in the near term due to this transition.

Selling, General and Administrative Expenses

Selling, general and administrative expenses were $13.0 million and $14.1 million for the years ended December 31, 2016 and 2017, respectively. The increase in selling, general and administrative expenses during this period of $1.1 million was primarily related to increases in marketing expense due to the launch of Saphyr, our new product platform, in February 2017 and increased headcount for customer support services. We expect selling, general and administrative expenses to increase in future periods as the number of sales, technical support and marketing and administrative personnel grows and we continue to broaden our customer base and grow our business. We also expect to incur additional expenses as a public company, including expenses related to compliance with the rules and regulations of the SEC and Nasdaq, additional insurance expenses, and expenses related to investor relations activities and other administrative and professional services.

Impairment of Property and Equipment

We did not recognize any impairment losses during the year ended December 31, 2016. During the year ended December 31, 2017, we recognized an impairment loss of $0.6 million related to our Irys instruments at customer sites as the carrying amount of the assets were determined to be in excess of the assets fair value.

Interest Expense

Interest expense was relatively consistent with $0.5 million and $0.6 million for the year ended December 31, 2016 and 2017, respectively.

Change in Fair Value of Preferred Stock Warrants

Change in fair value of preferred stock warrants was $3.0 million and $0.8 million for the year ended December 31, 2016 and 2017, respectively. The preferred stock warrants are subject to remeasurement at each reporting period, with changes in fair value recorded in the statement of operations.

Other Expense

Other expense was relatively consistent with $0.2 million and $0.3 million for the year ended December 31, 2016 and 2017, respectively.

Liquidity and Capital Resources

Since our inception, we have incurred net losses and negative cash flows from operations. We incurred net losses of $18.8 million, $23.4 million, and $7.2 million, and used $23.5 million, $20.8 million and $9.8 million of cash from our operating activities for the years ended December 31, 2016 and 2017 and the six months ended June 30, 2018, respectively. As of June 30, 2018, we had an accumulated deficit of $61.4 million and cash and cash equivalents of $7.6 million.

Sources of Liquidity

To date, we have financed our operations principally through private placements of our convertible preferred stock, borrowings from credit facilities and revenue from our commercial operations.

Preferred stock financings

As of December 31, 2017, we had raised approximately $129.3 million in net equity proceeds through sales of our preferred stock, including the sale of 49,819,157 shares of our Series D and D-1 convertible preferred stock and warrants to purchase 31,672,817 shares of our Series D convertible preferred stock, during the year ended December 31, 2016 at a purchase price of $0.48 per share for net proceeds of $23.5 million.

During the year ended December 31, 2017, we also issued 36,974,586 shares of Series D-1 Preferred Stock at a purchase price of $0.48 per share for net proceeds of $17.6 million.

See Note 8 to our consolidated financial statements for a discussion of the terms and provisions of our Series D and Series D-1 Preferred Stock issued in 2016 and 2017.

Loan facility

On March 8, 2016, we entered into a new term Loan and Security Agreement with Western Alliance Bank, or the Western Alliance LSA, for $7.0 million. The loan proceeds were used to repay the outstanding $5.0 million loan with Square 1 Bank, as required by the amended Loan and Security agreement between Square 1 Bank and us.

We received a notice of default from Western Alliance Bank notifying us that we were in default as of December 31, 2017, as we had failed to secure at least $15.0 million from the sale or issuance of our equity securities or subordinated debt as set forth in the amended Western Alliance LSA. Based on the loan default notice we determined to reclassify the total loan balance of approximately $6.7 million to current liabilities on the consolidated balance sheet as of December 31, 2017, as the loan could be called at any time by Western Alliance Bank.

In February 2018, the Western Alliance LSA was amended requiring the Company to secure $21.0 million in funding prior to June 30, 2018. As part of the amendment, Western Alliance Bank agreed to forbear from exercising any of its default remedies set forth in the LSA as a result of our loan default.

On June 13, 2018, the Western Alliance LSA was amended, replacing previously amended funding requirements and requiring the Company to secure $5.0 million in funding prior to August 3, 2018. Additionally, the amendment restricted the Company’s use of all cash collected from customers, received on and after the amendment date, until a total of $2.5 million of collections. As part of the amendment, Western Alliance Bank waived the existing default.

On June 29, 2018, we entered into a new Credit and Security Agreement with Midcap Financial Trust which provides for a five year $15 million term loan facility. The Credit and Security Agreement is secured by a lien covering substantially all of our assets, including intellectual property. Upon executing the agreement, we drew down a $10.0 million term loan from the credit facility. The loan proceeds were used to repay the outstanding $7.0 million balance on the Western Alliance LSA.

See Note 7 to our consolidated financial statements for a discussion of terms and provisions to the Western Alliance LSA and Midcap Financial CSA.

Note purchase agreement

On February 9, 2018, we entered into a Note Purchase Agreement with various investors, which included related parties, or the Investors, pursuant to which we agreed to sell the Investors 8% Convertible Promissory Notes, or the Convertible Notes, in the original principal amount up to approximately $16.0 million. On April 2, 2018, we amended the Note Purchase Agreement to, among other things, increase the principal amount available for issuance under the Note Purchase Agreement to approximately $18.4 million. In addition, in connection with the Midcap Financial CSA, we again amended the Note Purchase Agreement to increase the amount available for

issuance under the Note Purchase Agreement to approximately $19.4 million. The Convertible Notes have a maturity date of September 30, 2018 and are convertible either into our common stock or preferred stock, dependent on the conversion events as described in Note 12 to our consolidated financial statements.

As of June 30, 2018, the Company had received proceeds of approximately $14.4 million from the issuance of the Convertible Notes.

Cash Flows

The following table sets forth the cash flow from operating, investing and financing activities for the periods presented:

	Year Ended December 31,		Six Months Ended June 30,	
	2016	2017	2017	2018
Net cash provided by (used in):			(unaudited)	
Operating activities	$ (23,496,358)	$ (20,817,798)	$ (12,353,518)	$ (9,753,922)
Investing activities	(1,349,853)	(1,017,830)	(461,939)	(189,401)
Financing activities	25,431,061	17,607,905	13,232,128	16,545,714

Operating Activities

We derive cash flows from operations primarily from the sale of our products and services. Our cash flows from operating activities are also significantly influenced by our use of cash for operating expenses to support the growth of our business. We have historically experienced negative cash flows from operating activities as we have developed our technology, expanded our business and built our infrastructure and this may continue in the future.

Net cash used in operating activities was $12.4 million during the six months ended June 30, 2017 as compared to $9.8 million during the six months ended June 30, 2018. The decrease in cash used in operating activities of $2.6 million was the result of lower operating losses during the six months ended June 30, 2018 as compared to the six months ended June 30, 2017.

Net cash used in operating activities was $23.5 million during the year ended December 31, 2016 as compared to $20.8 million during the year ended December 31, 2017. The decrease in cash used in operating activities of $2.7 million was primarily the result of increased revenues.

Investing Activities

Historically, our primary investing activities have consisted of capital expenditures for the purchase of capital equipment to support our expanding infrastructure. We expect to continue to incur additional costs for capital expenditures related to these efforts in future periods.

Net cash used in investing activities was $0.5 million during the six months ended June 30, 2017 as compared to $0.2 million during the six months ended June 30, 2018.

Net cash used in investing activities was $1.4 million during the year ended December 31, 2016 as compared to $1.0 million during the year ended December 31, 2017. The decrease in cash used in investing activities of $0.4 million was the result of a decrease in the purchase of property and equipment in 2017.

Financing Activities

Historically, we have financed our operations principally through private placements of our convertible preferred stock and promissory notes and borrowings from credit facilities, as well as gross profits from our commercial operations.

Net cash provided by financing activities was $13.2 million during the six months ended June 30, 2017 as compared to $16.5 million during the six months ended June 30, 2018. The increase in cash provided by financing activities of $3.3 million was the result of proceeds from the issuance of convertible notes of approximately $14.4 million during the six months ended June 30, 2018, compared to proceeds from the issuance (and in advance of issuance) of convertible preferred stock of $13.2 million during the six months ended June 30, 2017. In addition, a new debt financing deal that closed in June 2018 produced net proceeds of approximately $2.5 million.

Net cash provided by financing activities was $25.4 million during the year ended December 31, 2016 as compared to $17.6 million during the year ended December 31, 2017. The decrease in cash provided by financing activities of $7.8 million was the result of the issuance of a smaller aggregate amount of convertible preferred stock in 2017 as compared to 2016.

Capital Resources

We have not achieved profitability since our inception, and we expect to continue to incur net losses in the future. We also expect that our operating expenses will increase as we continue to increase our marketing efforts to drive adoption of our commercial products. Additionally, as a public company, we will incur significant audit, legal and other expenses that we did not incur as a private company. Our liquidity requirements have historically consisted, and we expect that they will continue to consist, of sales and marketing expenses, research and development expenses, working capital, debt service and general corporate expenses.

We believe that the net proceeds from this offering, together with our cash generated from commercial sales and our current cash and cash equivalents, including the proceeds from our recent financings, will be sufficient to meet our anticipated operating cash requirements for at least the next 18 months. In the future, we expect our operating and capital expenditures to increase as we increase headcount, expand our sales and marketing activities and grow our customer base. Our estimates of the period of time through which our financial resources will be adequate to support our operations and the costs to support research and development and our sales and marketing activities are forward-looking statements and involve risks and uncertainties and actual results could vary materially and negatively as a result of a number of factors, including the factors discussed in the section “Risk Factors” of this prospectus. We have based our estimates on assumptions that may prove to be wrong and we could utilize our available capital resources sooner than we currently expect. Our future funding requirements will depend on many factors, including:

- market acceptance of our products;
- the cost and timing of establishing additional sales, marketing and distribution capabilities;
- the cost of our research and development activities; and
- the effect of competing technological and market developments.

We cannot assure you that we will be able to obtain additional funds on acceptable terms, or at all. If we raise additional funds by issuing equity or equity-linked securities, our stockholders may experience dilution. Future debt financing, if available, may involve covenants restricting our operations or our ability to incur additional debt. Any debt or equity financing that we raise may contain terms that are not favorable to us or our stockholders. If we do not have or are not able to obtain sufficient funds, we may have to reduce our commercialization efforts or delay our development of new products. We also may have to reduce marketing, customer support or other resources devoted to our products or cease operations

Contractual Obligations

The following summarizes our significant contractual obligations as of December 31, 2017:

	Payment Due by Period				
Contractual Obligations	Total	Less than 1 year	1-3 years	3-5 years	After 5 years
Operating leases	$ 2,591,952	$ 826,884	$1,765,068	$ —	$ —
Principal payments, interest and end of term fees on loan	8,426,862	8,426,862	—	—	—
	$11,018,814	$9,253,746	$1,765,068	$ —	$ —

Our operating lease obligations primarily relate to leases for our current headquarters in San Diego, California.

We also have ongoing obligations related to license agreements which contain immaterial minimum annual payments that are credited against the actual royalty expense, which are not included in the table above.

Purchase orders or contracts for the purchase of supplies and other goods and services are not included in the table above. We have a contractual commitment with a supplier to purchase $0.1 million of products each quarter until the first quarter of 2019. We are not able to determine the aggregate amount of other such purchase orders that represent contractual obligations, as purchase orders may represent authorizations to purchase rather than binding agreements. Our purchase orders are based on our current procurement or development needs and are fulfilled by our vendors within short time horizons.

Off-Balance Sheet Arrangements

We did not have during the periods presented, and we do not currently have, any off-balance sheet arrangements, as defined under SEC rules, and similarly did not and do not have any holdings in variable interest entities.

Critical Accounting Policies and Estimates

Our management's discussion and analysis of our financial condition and results of operations is based on our consolidated financial statements, which have been prepared in accordance with generally accepted accounting principles in the United States. The preparation of our consolidated financial statements requires us to make estimates and assumptions that affect the reported amounts of assets, liabilities and expenses and the disclosure of contingent assets and liabilities in our consolidated financial statements and accompanying notes. We evaluate these estimates and judgments on an ongoing basis. We base our estimates on 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.

While our significant accounting policies are more fully described in Note 2 to our consolidated financial statements appearing elsewhere in this prospectus, we believe that the following accounting policies are the most critical for fully understanding and evaluating our financial condition and results of operations.

Revenue Recognition

Product Revenue

Product revenue represents the sale of our instruments and consumables to third parties. Timing of revenue recognition on instrument sales is based upon when delivery has occurred, the price is fixed or determinable, and collectability is reasonably assured.

The majority of our instruments contain embedded operating systems and other software which is included in the purchase price of the instrument. The software is deemed incidental to the system as a whole as it is not sold or marketed separately and its production costs are minor compared to those of the hardware system. Hardware and software elements are both delivered when ownership is transferred to the customer.

Installation services for direct sale customers are performed at the same time or shortly after the product is delivered and require only a minimal effort to complete. We believe installation is a perfunctory service and is not material to our obligations in the contract.

Other Revenue

Other revenue includes revenue from extended service contracts and other services that may be performed. Revenue for extended warranty contracts is recognized ratably over the service period. Revenue for other services is generally recognized based on proportional performance of the contract, when the Company's ability to complete project requirements is reasonably assured. Deferred revenue represents amounts received in advance for on-going service arrangements. Most of these services are completed in a short period of time from the receipt of the customer's order. When significant risk exists in the Company's ability to fulfill project requirements, revenue is recognized upon completion of the contract.

Multiple Element Arrangements

We regularly enter into contracts where revenue is derived from multiple deliverables, including products or services. These contracts typically include an instrument, consumables, and extended service contracts. Revenue recognition for contracts with multiple deliverables is based on the individual units of accounting determined to exist in the contract. A delivered item is considered a separate unit of accounting when the delivered item has value to the customer on a stand-alone basis. Items are considered to have stand-alone value when they are sold separately by any vendor or when the customer could resell the item on a stand-alone basis.

For transactions with multiple deliverables, consideration is allocated at the inception of the contract to all deliverables based on their relative selling price. The relative selling price for each deliverable is determined using vendor-specific objective evidence, or VSOE, of selling price or third-party evidence of selling price if VSOE does not exist. If neither VSOE nor third-party evidence exists, we use our best estimate of the selling price using average selling prices over an appropriate period coupled with an assessment of current market conditions. If the product or service has no history of sales or if the sales volume is not sufficient, we consider our approved standard prices adjusted for applicable discounts.

In order to establish VSOE of selling price, we must regularly sell the product or service on a standalone basis with a substantial majority priced within a relatively narrow range. In cases where there is not a sufficient number of standalone sales and VSOE of selling price cannot be determined, then we utilize third-party evidence to establish selling price.

Distributor Transactions

In certain markets, we sell products and provides services to customers through distributors that specialize in life sciences products. In cases where the product is delivered to a distributor, revenue recognition generally occurs when title transfers to the distributor. The terms of sales transactions through distributors are generally consistent with the terms of direct sales to customers, except the distributors do not require our services to install the instrument at the end customer and perform the services for the customer that are beyond our standard warranty in the first year following the sale. These transactions are accounted for in accordance with our revenue recognition policy described herein.

Stock-Based Compensation Expense

Stock-based compensation expense represents the cost of the grant date fair value of employee stock option grants recognized over the requisite service period of the awards (usually the vesting period) on a straight- line basis. We estimate the fair value of stock option grants using the Black-Scholes option-pricing model.

The Black-Scholes option-pricing model requires the use of subjective assumptions, including the risk- free interest rate, the expected stock price volatility, the expected term of stock options, the expected dividend yield and the fair value of the underlying common stock on the date of grant. See Note 8 to our consolidated financial statements included elsewhere in this prospectus for information concerning certain of the specific assumptions we used in applying the Black-Scholes option pricing model to determine the estimated fair value of our stock options granted in the years ended December 31, 2016 and 2017 and the six months ended June 30, 2017 and 2018.

Determination of the Fair Value of Common Stock

We are required to estimate the fair value of the common stock underlying our stock-based awards when performing the fair value calculations using the Black-Scholes option pricing model. Because our common stock is not currently publicly traded, the fair value of the common stock underlying our stock-based awards has been determined on each grant date by our board of directors, with input from management, considering our most recently available third-party valuation of common shares. All options to purchase shares of our common stock are intended to be granted with an exercise price per share no less than the fair value per share of our common stock underlying those options on the date of grant, based on the information known to us on the date of grant.

The third-party valuations of our common stock were performed using methodologies, approaches and assumptions consistent with the American Institute of Certified Public Accountants Audit and Accounting Practice Aid Series: *Valuation of Privately Held Company Equity Securities Issued as Compensation*. In addition, our board of directors considered various objective and subjective factors to determine the fair value of our common stock, including:

- the prices of our convertible preferred stock sold to investors in arm's length transactions;
- the rights, preferences and privileges of our convertible preferred stock as compared to those of our common stock, including the liquidation preferences of our convertible preferred stock;
- our results of operations and financial position;
- the composition of, and changes to, our management team and board of directors;
- the lack of liquidity of our common stock as a private company;
- the material risks related to our business and industry;
- external market conditions affecting the life sciences and biotechnology industry sectors;
- U.S. and global economic conditions;
- the likelihood of achieving a liquidity event for the holders of our common stock, such as an initial public offering, or IPO, or a sale of our company, given prevailing market conditions; and
- the market value and volatility of comparable companies.

Following the closing of this offering, the fair value of our common stock will be the closing price of our common stock on the date of the grant.

The fair value of the underlying preferred stock was determined using an Option Pricing Method, or OPM. Under the OPM, once the fair market value of the enterprise is established, shares are valued by creating a series

of call options with exercise prices based on the liquidation preference and conversion behavior of the different classes of equity. Accordingly, the aggregate equity value is allocated to each of the classes of equity shares outstanding. The Company utilizes both the market and income approach to establish the fair market value of the enterprise.

Based on the assumed initial public offering price of $6.50 per unit (the midpoint of the price range set forth on the cover page of this prospectus), the intrinsic value of stock options outstanding as of December 31, 2017 would have been $3.3 million, of which $1.8 million and $1.5 million would relate to stock options that were vested and unvested, respectively, at that date.

Preferred Stock Warrant Liability

As of December 31, 2016, and 2017 and June 30, 2018, we had outstanding warrants to purchase 36,676,737, 36,603,557 and 37,228,557 shares of preferred stock, respectively. As of June 30, 2018, we had outstanding warrants to purchase 42,872 shares of Series B convertible preferred stock, 4,085,784 shares of Series B-1 convertible preferred stock, 32,183,234 shares of Series D convertible preferred stock and 916,667 shares of Series D-1 convertible preferred stock. See Note 8 to our consolidated financial statements included elsewhere in this prospectus for information concerning preferred stock warrant issuances during the years ended December 31, 2016 and 2017.

The warrants to purchase preferred stock are valued at each reporting period using the Black-Scholes-Merton model. This valuation includes observable inputs such as risk-free rate, as well as unobservable inputs for assumed volatility, the expected life of the warrants, and the fair value of the underlying preferred stock. See Note 3 to our consolidated financial statements included elsewhere in this prospectus for information concerning certain of the specific assumptions we used in applying the Black-Scholes option pricing model to determine the estimated fair value of our preferred stock warrants as of December 31, 2016 and 2017 and June 30, 2018. Following the closing of this offering, warrants to purchase an aggregate of 35,683,574 shares of preferred stock will be subject to automatic net exercise and termination, and warrants to purchase an aggregate of 1,544,983 shares of preferred stock will adjust into common stock warrants.

JOBS Act

We are an “emerging growth company,” as defined in the Jumpstart Our Business Startups Act, or JOBS Act. Under the JOBS Act, 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 new or revised accounting standards that have different transition dates for public and private companies until those standards would otherwise apply to private companies. We have elected to use this extended transition period. As a result of this election, our timeline to comply with these standards will in many cases be delayed as compared to other public companies that are not eligible to take advantage of this election or have not made this election. Therefore, our financial statements may not be comparable to those of companies that comply with the public company effective dates for these standards.

For so long as we are an emerging growth company we expect that:

- we will present only two years of audited consolidated financial statements, plus unaudited consolidated condensed financial statements for any interim period, and related management’s discussion and analysis of financial condition and results of operations in our initial registration statement;
- we will avail ourselves of the exemption from the requirement to obtain an attestation and report from our auditors on the assessment of our internal control over financial reporting pursuant to the Sarbanes-Oxley Act;

- we will avail ourselves of the extended transition periods available to emerging growth companies under the JOBS Act for complying with new or revised accounting standards; and
- we will provide less extensive disclosure about our executive compensation arrangements.

We will remain an emerging growth company for up to five years, although we will cease to be an "emerging growth company" upon the earliest of: (1) the last day of the fiscal year following the fifth anniversary of this offering, (2) the last day of the first fiscal year in which our annual revenues are $1.07 billion or more, (3) the date on which we have, during the previous rolling three-year period, issued more than $1.0 billion in non-convertible debt securities, and (4) the date on which we are deemed to be a "large accelerated filer" as defined in the Exchange Act.

Recent Accounting Pronouncements

See Note 2 to our consolidated financial statements included elsewhere in this prospectus for information concerning recent accounting pronouncements.

Quantitative and Qualitative Disclosures about Market Risk

The market risk inherent in our financial instruments and in our financial position represents the potential loss arising from adverse changes in interest rates. As of June 30, 2018, we had $7.6 million in cash and cash equivalents, consisting of non-interest and interest-bearing bank accounts. Our primary exposure to market risk is interest rate sensitivity, which is affected by changes in the general level of U.S. interest rates. Due to the short-term, low-risk profile of our bank accounts, an immediate 100 basis point change in interest rates would not have a material effect on the fair market value of our cash equivalents.

Internal Control Over Financial Reporting

Pursuant to Section 404(a) of the Sarbanes-Oxley Act, commencing the year following our first annual report required to be filed with the SEC, our management will be required to report on the effectiveness of our internal control over financial reporting. To comply with the requirements of being a reporting company under the Exchange Act, we will need to implement additional financial and management controls, reporting systems and procedures and hire additional accounting and finance staff, as well as potentially upgrade our information technology systems.

BUSINESS

Overview

We are a life sciences instrumentation company in the genome analysis space. We develop and market the Saphyr system, a platform for ultra-sensitive and ultra-specific structural variation detection that enables researchers and clinicians to accelerate the search for new diagnostics and therapeutic targets and to streamline the study of changes in chromosomes, which is known as cytogenetics. Our Saphyr system comprises an instrument, chip consumables, reagents and a suite of data analysis tools.

Structural variation refers to large-scale structural differences in the genomic DNA of one individual compared to another. Each structural variation involves the rearrangement or repetition of as few as hundreds to as many as tens of millions of DNA base pairs. Those rearrangements may be insertions, deletions, duplications, inversions or translocations of segments of one or more chromosomes. Structural variations may be inherited or arise spontaneously, and many cause genetic disorders and diseases. Until our commercial launch of the Saphyr system in February 2017, and since, we believe no products existed or exist that could more comprehensively and cost and time-efficiently detect structural variation.

Our Saphyr system comprises an instrument, chip consumables, reagents and a suite of data analysis tools. Our customers include researchers and clinicians who seek to uncover and understand the biological or clinical impact of genome variation to improve the diagnosis and treatment of patients with better clinical tests and new medicines or to replace existing cytogenetic tests that are expensive, slow and labor-intense, with a modern solution that simplifies workflow and reduces costs and that has the potential to significantly increase diagnostic yields across the industry. Our customers also include researchers in non-human segments such as agricultural genomics where they seek to advance their understanding of how structural variation impacts industrial applications of plants and animals. We have established relationships with key opinion leaders in genomics research and clinical applications, including rare diseases and oncology, and our installed base of over 90 systems made up of Saphyr and its predecessor system includes some of the world's most prominent clinical, translational research, basic research, academic and government institutions as well as leading pharmaceutical and diagnostic companies. Examples include Children's National Health System, DuPont Pioneer, Garvan Institute of Medical Research, Genentech, Icahn School of Medicine at Mount Sinai, McDonnell Genome Institute at Washington University, National Institutes of Health, Pennsylvania State University and Salk Institute for Biological Studies. Our revenues in 2017 were $9.5 million, representing approximately 40% growth over the prior year, and for the first half of 2018 our revenues were $5.2 million, representing approximately 32% growth over the prior year comparable period. Our cumulative revenues for the period from January 1, 2016 through June 30, 2018 from each of the customers listed above were, respectively, $0.5M, $0.5M, $0.3M, $0.3M, $0.1M, $0.4M, $0.1M, $0.3M, and $0.1M.

Approximately 6,000 research use only, or RUO, high throughput sequencers are currently installed worldwide. These sequencers are developed and sold almost entirely by Illumina and are owned by an estimated 3,000 unique customers. Sequencing is very good at detecting genome differences involving just a few base pairs or single-nucleotide variations, which Saphyr cannot detect, but sequencing including next-generation sequencing, or NGS, cannot reliably detect the larger structural variations that our Saphyr system can detect. Therefore, Saphyr is being adopted alongside this installed base of sequencers as a complement that gives users the ability to see a much wider scope of genome variation than ever before.

The Saphyr system, which is for RUO, is also beginning to be adopted by cytogenetics labs that seek to use it in commercial clinical tests of its patients as an LDT. These labs currently rely on existing methods such as karyotyping, fluorescence in situ hybridization, or FISH, and microarrays for clinical tests and research that look at chromosomal structure, location and function in cells. Major guidelines for oncology and genetic disease clinical diagnostics recommend first-line structural variation testing by these existing methods. The organizations issuing these guidelines include, among many others, World Health Organization (WHO), National

Comprehensive Cancer Network (NCCN), American College of Medical Genetics (ACMG) and American College of Obstetricians & Gynecologists (ACOG).

Saphyr and its predecessor system, which we collectively refer to as our system in this prospectus, have been cited by researchers and clinicians in approximately 130 publications covering structural variations in areas of high unmet medical need and research interest, such as rare and undiagnosed pediatric diseases, muscular diseases, developmental delays and disorders, prostate cancer and leukemia. Importantly, Saphyr can be used alone to provide comprehensive detection of structural variations and enable diagnostic calls without the need for any sequencing or cytogenetic technology.

Industry Background

Genome analysis is the process of extracting biological information from DNA. DNA is the code that is found in all living cells and determines the characteristics and health of all living organisms. Although each organism's DNA order is unique, all DNA is composed of the same four nucleotides that come in pairs, which are referred to as base pairs. The human genome is composed of six billion of these base pairs (three billion of which are the maternal copy and three billion of which are the paternal copy of the genome), distributed across 23 pairs of chromosomes ranging in size from approximately 50 million to approximately 250 million base pairs. Genome variation is defined as at least one base pair differing in a comparison of sequence against a reference standard and can be as large as tens of millions of base pairs.

It had long been believed by the scientific community that all problems in genome analysis could be addressed by DNA sequencing, which is a method of determining the precise order of the bases adenine (A), guanine (G), cytosine (C) and thymine (T) in a genome. Many in the industry felt that the only bottlenecks for sequencing companies to address were the cost per genome and the throughput of the sequencers. If these issues could be addressed, it was generally believed that sequencing would usher in a new wave of medical-grade genome analysis that would give rise to an abundance of highly impactful discoveries in medicine. These discoveries would lead to novel therapies and patient management pathways driven by exquisitely specific and sensitive diagnostic tests.

In recent years, however, it has become evident that sequencing is not completely fulfilling the needs of researchers and clinicians. For example, after 10 years with next-generation sequencing in use, the diagnostic yields of the leading genetic testing laboratories in the world continue to hover around only 50%, which is where they have been for at least two decades, meaning that only half of patients receive a confirmed pathogenic diagnosis. Researchers and clinicians now agree that despite major advances in the speed and cost-effectiveness of sequencing, it fails to reliably detect structural variations, which represent an entire class of genome variation.

Structural variation is one of the most biologically important aspects of the human genome. It is the underlying driver of many known human diseases, including numerous genetic disorders, inherited diseases and cancer. Structural variations occur when relatively large groups of base pairs change their existence or position in the genome relative to a normal standard. Structural variations can be as small as a few hundred base pairs or as large as tens of millions of base pairs and can be confined to one chromosome or can unfold between chromosomes. The changes can be rearrangements in location, order or orientation, and they can involve the insertion, deletion or duplication of entire blocks of base pairs. As an example of the importance of structural variations, thousands of base pairs can be rearranged and result in the ABL gene from one chromosome joining the BCR gene on an entirely different chromosome to form BCR-ABL, an oncogenic fusion gene which causes certain leukemias.

We believe the available methods to detect structural variations for research and clinical applications, other than Saphyr, are antiquated and cumbersome and can only detect a small proportion of the structural variations across an entire genome. These methods therefore have very limited utility in population research studies that seek to discover new structural variations to explain pathology. Without additional tools, researchers and

clinicians cannot comprehensively study the genome, which will ultimately result in the failure of genomics to deliver on its full promise of new therapies and diagnostics.

The Saphyr system provides a solution for comprehensive structural variation analysis. The Saphyr system is a proprietary, sample-to-result platform based on physical mapping of the genome, which is the process of assigning the chromosomal location, order and orientation of the functional elements of the genome. We believe that Saphyr is the only product capable of detecting structural variations at high sensitivity and specificity with a workflow that is cost-effective and time-efficient. A complete and accurate physical map of the genome enables the user to much more readily and systematically detect the structural variations that sequencing and cytogenetics technologies miss. Our mapping makes it possible for researchers and clinicians to more comprehensively detect structural variations and measure the complete scope of genome variation present in their study populations.

Market Opportunity

According to Research and Markets, the worldwide market for genomics products and services is expected to reach approximately $23.9 billion by 2022, up from approximately $14.7 billion in 2017, representing a compound annual growth rate of 10.2%. We believe that the market opportunity is predominantly split among three regions: North America, Europe and Asia. Within Asia, one of the fastest growing genomics markets is China, where adoption of genome analysis technology has been growing at approximately 20% per year.

The two segments of the genomics market that are driving the uptake of our product are:

- ***Sequencing for Discovery Research.*** In discovery research across patient cohorts, sequencing is primarily used to find single nucleotide variations responsible for disease or therapeutic response. Sequencing alone, however, is significantly limited due to its inability to reveal structural variations. Our Saphyr system has been expanding this market segment by complementing sequencing to expand the scope of genome variation that can be analyzed in a study and achieve a more comprehensive view of the genome.
- ***Cytogenetics.*** To provide a clinical diagnosis, cytogenetic tests detect known variations that are linked to specific diseases or therapeutic responses. The technologies used for detecting structural variations are expensive and involve cumbersome workflows with relatively limited ability to scale to higher volumes or more complex testing panels. Sequencers tend not to be used for cytogenetics due to their inability to reliably detect structural variations. Cytogenetics laboratories are beginning to adopt Saphyr as a more effective and efficient approach to finding the structural variations relevant to cytogenetics. For this segment, Saphyr is used alone to provide comprehensive detection of structural variations and enable diagnostic calls without the need for any sequencing or cytogenetic technology.

We believe that the discovery research and cytogenetics segments together comprise an addressable opportunity for us to sell up to approximately 8,500 Saphyr systems, representing a current total instrument market opportunity of approximately $2.1 billion. Importantly, we expect this market opportunity to expand at the rate of adoption of new RUO high throughput sequencers which we estimate is over 15% per year. While we do not expect the number of cytogenetics labs to increase significantly, we do expect our growth in this market to be driven by conversion of traditional cytogenetics methodologies to our Saphyr system.

In addition to the instrument sales opportunity, Saphyr instruments generate recurring revenue from chip consumables that are used on a per-sample basis. We believe each Saphyr instrument has the potential to create recurring revenue in a range of approximately $75,000 to approximately $150,000 per year, suggesting a potential annual recurring revenue opportunity of approximately $0.6 billion to approximately $1.3 billion.

Therefore, we believe that our currently addressable portion of the genome analysis market is estimated to be between $2.7 billion and $3.4 billion.

Existing Technologies and Their Limitations

Existing technologies fail to adequately address the need for structural variation detection because they do not overcome the inherent complexity of the genome or they are not capable of providing a cost-effective, scalable solution to meet the increasing demands of genomics research and clinical applications.

The Genome Is Complex

Genome composition itself makes the measurement of genome structure and structural variation inherently difficult. Genome sequence is built from combinations of only the A, G, C and T nucleotides. The nucleotides have a natural pairing system in which A pairs with T and G pairs with C. Each pair of nucleotides is referred to as a base pair. In humans, the approximately six billion base pairs are distributed across 23 pairs of chromosomes. A chromosome is an organizational unit that biology has evolved to compartmentalize genomic information. One set of 23 chromosomes (three billion base pairs) is inherited from each parent. Within each chromosome, the base pairs are organized into functional elements such as genes, which code for protein production, and other elements that regulate how and when the genes are expressed for protein production.

The six billion base pairs that make up the human genome cannot be read by any existing technology in a simple linear, contiguous fashion. Due in part to only four unique nucleotides being available to write the entire genetic code, it is very common for stretches of sequence to be identical either within the same chromosome or between chromosomes. As much as two-thirds of the human genome is made up of repetitive DNA sequences. This repetition tends to cause structural variations to be flanked by sequences that are identical to sequences in other parts of the genome which further complicates structural variation detection.

The Genome Orchestrates Life and Genome Structure Is Key

Genome structure is the way in which the functional elements are organized. Namely, the location on each chromosome where the gene or functional regulatory elements are found, what order and orientation they are in and how many of each element are present. This organization is an essential part of the instructions that the organism uses in every one of its cells to develop and differentiate and to react and respond to its environment over its lifetime. When this critical location, order, orientation or quantity vary, it is termed structural variation.

Even though both single nucleotide variation and structural variation are each very common, a much larger number of variant nucleotides in the average human genome are found in structural variations as compared to single nucleotide variations. A recent study showed that 30 million base pairs, on average, in the human genome are part of structural variations while only 10 million are single nucleotide variations. Most variations are inconsequential and make up the background variation responsible for the diversity of life. Over time, these variations can randomly affect genes and proteins which, through natural selection, drive diversity and evolution across species and diversity within them. Variations can also cause disease.

Relative to single nucleotide variations, structural variations are much more apt to be profoundly disruptive. They often cause a tectonic shift in the genome. These genomic shifts can have devastating effects on the health of a human. Examples where structural variations caused a disruption of genes resulting in disease include:

- dystrophin gene variation – structural variation disrupting dystrophin production that is found in Duchenne Muscular Dystrophy;
- 9pminus variation – deletion found in a rare developmental syndrome in children;
- TMPRSS2-ERG fusion – gene fusion found in prostate cancer;
- EML4-ALK fusion – gene fusion found in lung cancer; and
- BCR-ABL fusion (Philadelphia chromosome) – gene fusion found in leukemias such as chronic myelogenous leukemia, acute lymphoblastic leukemia and acute myelogenous leukemia.

It is important to detect these structural variations and the potentially thousands of other structural variations in each individual. Sequencing and cytogenetics simply do not elucidate comprehensive structural variations in a systematic and cost- and time-efficient manner. Most structural variations found to date that have been implicated in disease, such as those listed above, were discovered through laborious, expensive, unindustrialized and non-comprehensive methods over the course of many years. Thousands of additional important structural variations are believed to exist and are expected to be found with a systematic structural variation detection tool such as our Saphyr.

The Limitations of Sequencing

As the first complete draft of the human genome was being assembled in 2000, the belief arose that most questions in genome analysis could be addressed by sequencing. Over the course of over 15 years, sequencing proliferated across the entire genome analysis community with Illumina becoming the clear sequencing industry leader. As more sequencing data emerged, it became apparent that sequencing alone would not adequately elucidate the causes of human disease. The promise of sequencing was not fully delivered due to sequencing's inability to address the complexities of genome composition.

Nearly all genome sequencing, including next-generation sequencing, uses a method called sequencing by synthesis. Sequencing by synthesis is an in-vitro process for synthesizing a copy of DNA, one base at a time in a way that makes it possible to measure the identity of each base as it is incorporated into the growing DNA copy. Sequencing by synthesis involves cutting genomic DNA into small pieces of a few hundred base pairs each, amplifying these pieces many times and anchoring them to a solid support where they are copied by a polymerase using fluorescently labeled bases. These copies are called sequencing reads. Illumina, which is the world leader in next-generation sequencing technology, markets systems that provide average read lengths that are 100 to 300 base pairs long. These short reads are matched by computer programs to a reference genome in a process called alignment. The reference is meant to represent the "standard" human genome in a normal, non-diseased state. It is the result of billions of dollars spent on the Human Genome Project and other initiatives begun in the late 1990s and early 2000s to put together the first complete set of human DNA code. When a patient's genome is sequenced today, the short reads are compared against the reference as a template. Using this approach, sequencing attempts to reconstruct, or "resequence," the genome and infer genome variations.

The read lengths typical for next-generation sequencing are often too short to determine the right location and orientation of a reading frame in the genome because many of the reads from one chromosome are identical to reads from either another chromosome or even another location on the same chromosome. When reads are indistinguishable from one another, computations cannot be performed to place the reads in the correct location in the genome.

The other significant limitation with next-generation sequencing is that the genome fragments used as templates in the copying process are also very short. This fragmentation is a result of the methods used for DNA isolation from the cell and the use of polymerase chain reaction, or PCR. These short lengths disconnect and destroy most of the structural information of the original genome and make next-generation sequencing unable to reliably detect genomic variations larger than a few hundred base pairs.

If the sequencing reads were accurate, on the order of hundreds of thousands of base pairs long and from templates that were even longer, they would overcome the redundancy of genome composition and every read would have a unique position in the genome. It would then be possible to assemble a structurally accurate picture of the genome. Accurate structural variation would be revealed upon comparing structurally accurate assemblies of genomes across a population to determine the structural changes that are driving the observed pathology or physiology.

The recognition of the need for greater lengths of sequence reads to determine genome structure, birthed the so-called long-read sequencing submarket. Because of the need for long-read sequencing, Pacific Biosciences of

California developed a system that uses another alternative form of sequencing by synthesis, while Oxford Nanopore Technologies developed a system that uses nanopore technology. These systems provide users with average read lengths in the tens of thousands of base pairs. However, these read lengths have proven not to be long enough to reliably and comprehensively detect structural variations. Pacific Biosciences' polymerases cannot regularly produce reads that are the necessary hundreds of thousands of base pairs in length. In addition, Oxford Nanopore's system has difficulty reliably feeding molecules that are, on average, hundreds of thousands of base pairs in length through each nanopore. The time and cost of providing a comprehensive whole genome analysis of a patient in a clinical setting is prohibitive when using these longer-read technologies.

In summary, all existing sequencing technologies, whether short or long, do no provide a solution for integrating structural variation into patient diagnosis and management.

The Limitations of Cytogenetics

Cytogenetics is the study of chromosomal structure and how structural variations impact health. The field has historically relied on karyotyping, FISH and more recently, microarrays. These methods each can detect some structural variations, but they are all inadequate solutions for high volume and low cost genetic testing for structural variations and none is an approach that can comprehensively detect structural variations with the ultra-high sensitivity and ultra-high specificity of the Saphyr system.

Karyotyping

Karyotyping is the gross optical examination of the chromosomes using a microscope. It is a laboratory technique, modernized in the 1960s, whereby the chromosomes from one cell are stained and visualized by a pathologist or technician to investigate the total number and structure of chromosomes.

Karyotyping has many limitations. It is cell culture dependent and therefore requires live and actively dividing cells. Karyotyping has extremely low resolution and is therefore only sensitive for very large structural variations that are unambiguous to identify. Given that chromosomes are being directly viewed on a slide by a pathologist with a microscope, resolution tends to be limited to structural events that are larger than five million base pairs. When karyotyping is used to diagnose unknown genetic disease, only about 5% of karyotyping tests result in a confirmed pathogenic finding. The test is costly, and its results are subject to each pathologist's interpretation which introduces variability in diagnostic calls and makes the methodology not amenable to automation.

FISH

FISH is a molecular cytogenetic technique that is used to detect chromosomal aberrations. FISH is based on the idea of using a specifically developed probe to detect a particular gene abnormality that is suspected to be in the genome. When the probe finds targeted variation, it binds to it and generates a fluorescent signal which is observed with a fluorescence microscope.

Several characteristics of FISH limit its productivity and efficiency for use in structural variation detection. Like karyotyping, it is cell culture dependent and therefore requires live and actively dividing cells. Also, FISH is limited to known targets and cannot be used for discovery. Every FISH test performed needs to be chosen to look for a specific genetic marker that the clinician anticipates may be found based on the clinical symptoms of the patient. In addition, the test results can be ambiguous and inconclusive, and reproducibility and variability among users can be a significant issue. Like karyotyping, FISH's diagnostic yield is very low when used to diagnose unknown genetic disease with only an estimated 7% of FISH providing a confirmed pathogenic finding. In addition, FISH is expensive, especially for the limited amount of information that it provides.

Microarrays

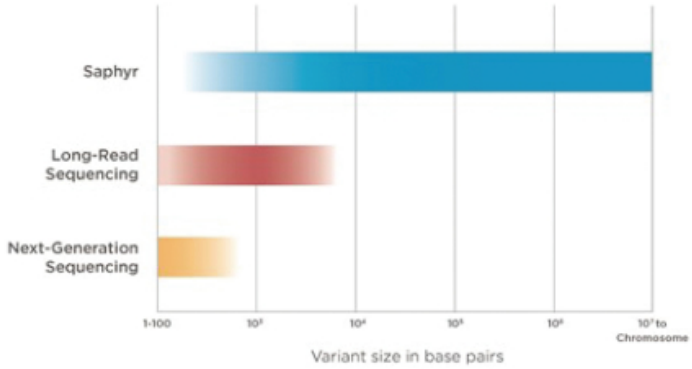
Chromosomal microarrays and SNP (single nucleotide polymorphism) arrays are tests consisting of slides that contain thousands of spots of DNA fragments that bind to the DNA of the sample. Microarrays detect gains and losses of specifically chosen DNA sequence and can also infer gene expression levels. Microarrays interrogate thousands of genes simultaneously that are known to be associated with presumed genetic disorders of interest to the user. Probe coverage is typically highly focused in regions of known clinical significance.

Microarrays have limited utility as a diagnostic tool as they are only useful when there are gains and losses of base pairs within the sample's genome that are specific to the probes that are populated on the array. Microarrays are also limited in their ability to provide specific locations of gains or losses on a chromosome, or even identify on which chromosome that the gains or losses occur. In addition, microarrays have low resolution as they cannot reliably detect structural variants smaller than 50,000 base pairs. Also, the diagnostic yield of microarrays is low. Only an estimated 20% of microarray tests provide a confirmed pathogenic finding when used to diagnose unknown genetic disease.

Our Solution

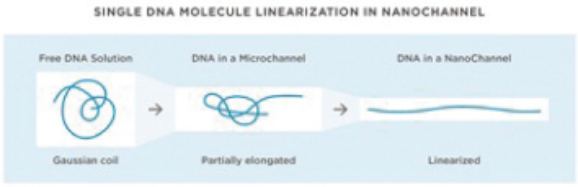
Our approach to measuring genome structure and structural variation is novel and highly differentiated. Most efforts in the genomic industry to address structural variation have been based on taking sequencing by synthesis as the starting point and attempting to overcome its deficiencies to make it applicable to structural variation analysis. In contrast, the Saphyr system directly observes extremely long genomic DNA without any amplification to construct a physical map that accurately assigns the chromosomal location, order, orientation and quantity of all the genome's functional elements. Our solution is built upon four key elements:

- **Extremely long molecules for analysis.** Structural accuracy can only come from analysis of extremely long chromosomal fragments. The Saphyr system is capable of analyzing single molecules that are on average approximately 250,000 base pairs long. Such fragments will contain enough unique sequence information that they are distinguishable from other fragments. These lengths are over 1,000 times longer than the average read length with Illumina systems and approximately 10 times longer than the average read lengths with Pacific Biosciences and Oxford Nanopore systems. Building a picture of the genome with massive building blocks overcomes the inherent challenge of genome complexity and is the key to Saphyr's unprecedented sensitivity and specificity.



- **Proprietary nanotechnology for massively parallel linearization and analysis of long molecules with single molecule imaging.** Analyzing these extremely long chromosomal fragments required invention. Molecules of this size are more like balls of yarn in a test tube and must be unraveled for meaningful analysis. We invented, patented, developed and commercialized nanochannel arrays to

capture them from solution and unwind and linearize them for structural variation analysis. Each molecule is imaged separately, making it possible to deconvolute complex mixtures including haplotypes and heterogeneous tumors, as shown in the graphic below.



- **DNA labeling chemistry specifically for physical mapping.** The detailed analysis of sequence we use is also highly unique and novel. Instead of identifying the sequence of every base pair in these long fragments, we label and detect specific sequence patterns or motifs that occur universally across every genome with an average frequency of approximately one site for every few thousand base pairs. The key to our method entails introducing fluorescent tags at the sequence-specific site using highly specific and robust enzymatic chemistry along the extremely long fragments. These fragments, stretched out in nanochannels, are then directly imaged allowing us to measure the distance between labels with high accuracy. The pattern of labels detected on all these fragments can then be related to the pattern of sequence motif sites in a reference genome for comparison. Changes in the pattern indicate structural variation.
- **Bioinformatic tools for structural variation analysis.** Finally, our approach includes a novel bioinformatics platform that we developed from the ground-up to take advantage of the unique benefits of our solution. It comprises proprietary algorithms for the construction of a structurally accurate physical map of the genome without using a reference genome in assignment of structure. Physical maps of a test subject are then compared in cross-mapping analysis that allows our system to detect genome wide structural variation, including the most complex balanced events. Our system can do so by comparing one physical map against a common reference, or against the maps of a mother and father in the case of an afflicted child with an undiagnosed disease for example, or against maps of normal blood when studying solid tumor cancers. This comparative approach uses our proprietary database of healthy individuals to filter out the non-disease causing structural variants found in the general healthy population.

Our Focus Areas

Our Saphyr system serves many segments of the genomics market seeking to find and understand structural variation. We have identified focus areas where we concentrate our resources to ensure robust adoption of our system and frequent utilization of consumables. We have selected these segments because of their urgent need to detect structural variations and the significant economic opportunity they represent. Our current focus areas are human genetic diseases, including rare diseases and oncology. Our Saphyr system, which is for RUO, is being used for basic and translational research and also beginning to be adopted by cytogenetics labs that seek to use it in commercial clinical tests of its patients as an LDT.

Rare Diseases

In genetic disease, existing tools have reached a plateau where almost half of patients with genetic disease who are tested in clinical laboratories fail to receive a molecular diagnosis. In order to increase diagnostic yield, a massive increase in the understanding of the complete structure and variation of the genome is essential. We believe the various studies presented below illustrate how Saphyr is essential to achieving this objective.

Example: Undiagnosed Diseases Network Patient

The National Institutes of Health funded Undiagnosed Diseases Network, or UDN, brings together top clinical and genomics teams from several key institutes in the U.S. to study the most difficult to diagnose genetic disease patients. Through a collaboration with UCLA, Dr. Eric Vilain of Children's National Medical Center runs all UDN patients of the UCLA cohort on Saphyr to identify pathogenic variants that go undetected using sequencing or cytogenetics in known or novel genes.

While data collection and a full analysis of the cohort is ongoing, at the American Society of Human Genetics, or ASHG, annual meeting, Dr. Vilain's team presented preliminary results on the first 12 UDN patients and their parents analyzed with Saphyr. In each family, Saphyr detected thousands of variants of which more than 100 were rare, and typically three to seven structural variations that were new to the patient, referred to as de novo structural variations, were identified. In one case presented at ASHG, whole genome sequencing and chromosomal microarray on the DNA of a girl with developmental delay, autism, poor sleep and self-mutilation failed to identify pathogenic variants. Saphyr was able to detect a 2,500-base pair insertion inherited from the father in a gene where whole genome sequencing had picked up a random mutation inherited from the mother. Together, the two variants create a compound heterozygous mutation in a gene with a known phenotype that includes poor sleep, developmental delay and autism with self-mutilation. Large heterozygous insertions like the one presented here are seldomly detected by next-generation sequencing and are too small for microarrays. The diagnosis of this patient was only possible by the combination of next-generation sequencing and Saphyr.

Based on Dr. Vilain's results, including a study on patients with Duchenne Muscular Dystrophy published in Genome Medicine, Saphyr targets the 40% to 70% of genetics patients who cannot be diagnosed with exome or whole genome sequencing. Saphyr has the power to replace multiple tests for genetic disorders, including microarrays, PCR tests and chromosomal cytogenetic tests. Each existing test requires a patient to visit a clinician and most often provides an inconclusive result. Dr. Vilain showed evidence that integration of Saphyr into existing diagnostic regimens can help to change the way that medicine is practiced.

Example: Rare Familial Cancer

A rare cancer, occurring in approximately one in one million people, was found in four members of a single extended family. A team at MD Anderson Cancer Center had used all standard clinical tools and whole genome sequencing on the affected family members but failed to identify any causative variants. Using Saphyr data, a 38,000-base pair sequence was found in these patients in six tandem copies, while unaffected family members had a single copy of this sequence. The duplication was found to be upstream of an important gene in the pathway known to be upregulated in this rare cancer. The identification of this mutation could be useful for pre-implantation embryo analysis and targeted treatments.

Example: Repeat Expansion Disorder

In a study by Dr. Eric Wang of the University of Florida, Saphyr was able to precisely count the number of times that a sequence segment was repeated in muscle cells derived from a patient with Myotonic Dystrophy. This devastating disease is a repeat expansion disorder, caused by the extreme lengthening of short repeat array in the genome. Other diseases in this category include ALS, Huntington's Disease, and Fragile-X disease. Current methods that do not utilize our Saphyr system cannot measure the length of such repeat arrays accurately. Saphyr's ability to measure the normal and expanded repeat with unprecedented accuracy and detail on single molecules could help allow the development of better targeted tests and medicines.

Example: Greenwood Genetic Center

Greenwood Genetic Center, based in South Carolina, has acquired Saphyr as part of a project to increase the diagnostic yield for patients with genetic disorders and cancer. As one of the first centers in the world to

introduce next-generation sequencing in a diagnostic setting, Greenwood Genetic Center aims to introduce a lab developed test, or LDT, based on Saphyr. As such, a number of patients with a variety of birth defects and developmental disorders are being analyzed on Saphyr.

In genetic disease, the standard of care consists usually of a combination of both phenotype-dependent targeted tests, and whole-genome analysis approaches. Targeted tests can consist of Multiple Ligation Probe Amplification, or MLPA, to test for the presence or absence of specific exons, PCR amplification and Sanger sequencing of candidate genes and multiple FISH probes to pick up specific structural variants common to the expected disease. For whole genome approaches, first tier diagnostic tools include karyotyping techniques like metaphase chromosome spreads and in some cases microarrays. More recently, whole exome sequencing or whole genome sequencing are increasingly being introduced.

A future workflow in which Saphyr replaces the large majority of FISH and MLPA tests for a genetics clinic such as Greenwood Genetic Center would rely on Saphyr to detect all structural variants larger than 500 base pairs, and on next-generation sequencing to detect all single nucleotide variants and other variants smaller than 500 base pairs. Since up to numerous FISH and MLPA tests are often performed, Saphyr's single whole genome analysis provides a cost effective solution that saves significant amounts of time, labor and analysis in lieu of such tests.

Oncology

In cancer, each patient has a unique disease with a complex pattern of genome changes. Traditional and recently-developed treatments do not attack the individual changes in each patient's tumor. Recent personalized medicine programs aim to provide clinicians with individual treatments specifically targeting the mutations found in each patient's cancer. For personalized cancer medicine to be successful, all variants in the cancer genome need to be detected, which is not feasible with cytogenetic or whole genome sequencing approaches. The studies presented below demonstrate that Saphyr is critical for a complete understanding of a cancer genome, which is essential to enable truly targeted treatments.

Example: Hematologic Malignancies

In a study to be published in Nature Genetics, Dr. James Broach, Director of the Penn State Institute for Personalized Medicine, presented system's ability to detect large rearrangements in leukemia, with a strong focus on translocations. In his research, our system detected all known translocations identified with standard clinical tools and, importantly, many structural variations never before identified in cancer, plus hundreds of structural variations that could not be seen by other methodologies.

Attempts by Dr. Broach to detect translocations using next-generation sequencing were unsuccessful because of the large number of false positive translocation calls. Because of the highly repetitive nature of the human genome, many remote genomic regions have high sequence homology, and short-read sequencing often fails to correctly map reads to the correct genomic origin, leading to excessive false positive calls. The extremely long molecules that our system analyzes span long repetitive segments of sequence and can anchor sequences into the correct genomic context, leading to extremely few false positive calls.

Given the high speed, low cost, industry-leading sensitivity and high reliability of our system displayed in this study, Dr. Broach showed evidence that our system is well positioned to eventually become the primary tool for clinical detection of genomic structural variation.

Example: Prostate Cancer

In a study published in Oncotarget, Dr. Vanessa Hayes at the Garvan Institute of Medical Research in Australia presented a complete tumor-normal comparison from a primary prostate cancer. Dr. Hayes' team

identified 85 large somatic deletions and insertions, of which half directly impact potentially oncogenic genes or regions. Only 11% of these large structural variations were detected using high-coverage, short-read next-generation sequencing and bioinformatics analyses using a combination of the leading structural variation calling algorithms for next-generation sequencing data. Many structural variations detected with our system were flanked by repetitive sequences, making them undetectable to short-read sequencing.

In subsequent studies presented at the Advances in Genome Biology and Technology annual meeting, Dr. Hayes detected several oncogenic driver mutations in metastasized prostate cancer samples. Several of the reported mutations were variants previously found in other cancer types but never before reported in prostate cancer, and for which effective treatments are available. Existing gene panels or FISH tests performed on cancer samples only test for expected variants. Our system's whole genome analysis approach is the only molecular method that is capable of identifying all major structural variants in a cancer genome with sufficiently high sensitivity. To make existing targeted cancer therapies more effective and to discover new ones, a complete characterization of the genome is important, making our system valuable in personalized cancer medicine.

Our Products

We develop and market the Saphyr system, a complete sample-to-result solution for structural variation analysis that empowers comprehensive genome analysis and facilitates a deeper understanding of genetic variation and function. We believe it is the only solution capable of addressing the needs for structural variation analysis because it is:

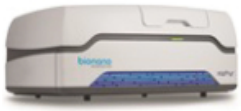
- **Highly sensitive.** We believe Saphyr is the most sensitive structural variation detector currently on the market in that it can identify structural variations that no other system can.
- **Highly specific.** The structural variations found by Saphyr are found by direct observation rather than inference. Saphyr has a very low false positive rate, typically less than 2%.
- **Cost effective.** We anticipate that the Saphyr users' cost per sample will reach $500 in 2018, which would represent one-tenth of what it was in 2014. We expect this cost per sample to continue to decline to less than $300 per sample in 2019 and less than $100 per sample in 2020.
- **Fast.** Saphyr generates greater than 640 giga base pairs of information per day, on par with some of the faster short-read sequencers in the market. For highly sensitive structural variation detection, this allows Saphyr to process two human samples per day. We expect Saphyr's throughput to increase to six per day by the middle of 2019 and 12 per day by the end of 2020. Over this same period, we expect to continuously improve the automation of sample prep and bioinformatics to help drive efficiencies of workflow.

Saphyr is being adopted across an extensive base of customers in world-class clinical, translational research, basic research, academic and governmental institutions as well as pharmaceutical and biotechnology companies.

We began marketing the Saphyr system in February 2017 after previously marketing Irys, our first-generation system, which was a slower system. We sell through a direct sales force and support organizations in North America and Europe, and through distribution partners in the Asia-Pacific and other regions of the world. We have sold more than 90 of our systems to over 80 customers globally. We continually seek to expand our product offerings to meet the needs of our customers.

When customers adopt the Saphyr system, they acquire one or more instruments, chips, reagents for DNA isolation and labeling and a suite of bioinformatics tools. The chips and reagents are used on a recurring basis. We also sell them ancillary solutions such as servers, reagents and other non-proprietary components used with the system. We designed Saphyr to accommodate performance upgrades without the need for replacement of the entire instrument. We intend for these performance enhancements to be delivered through software upgrades, purchased hardware upgrades and new chips and reagents.

The Saphyr Instrument



The Saphyr instrument is a single-molecule imager that includes high performance optics, automated sample loading based on machine learning algorithms and computational hardware and control software. The instrument's high-performance optics simultaneously image DNA linearized in hundreds of thousands of nanochannels. The instrument's control interface is the user's primary control center to design and monitor experiments as they occur in real time. The computational hardware is responsible for the secondary processing of the image data being produced on the Saphyr.

The Saphyr instrument currently analyzes one Saphyr chip, containing up to two samples, per day with statistically relevant depth of coverage across each whole genome. An upgrade of the capability of the Saphyr instrument to process two chips, instead of one, per run is planned for the middle of 2019. This instrument upgrade along with the planned improvements to the chip mentioned below will enable Saphyr to process up to six human samples per day by the middle of 2019 and 12 per day by the end of 2020.

The Saphyr Chip

The Saphyr chip is the consumable that packages the nanochannel arrays for use in genome analysis. In its current form, each Saphyr chip has two flow cells. Each flow cell contains approximately 120,000 nanochannels that are roughly 50 nanometers wide and can hold a unique sample, which enables a researcher to analyze two samples per chip per day. We plan to offer a new chip to our customers in the middle of 2019 that will have three flow cells which, combined with the instrument upgrade mentioned above, will allow Saphyr to process six human samples per day. In 2020, we expect to offer a 12-flow cell version of the chip. The instrument at that time will be able to run two chips per run; however, given the increased processing load of the 12-flow cell chip relative to the three-flow cell chip, Saphyr is expected to take two days to process two 12-flow cell chips, thereby enabling a throughput of 12 samples per day in 2020.

To manufacture the arrays, we use photolithography in a semiconductor fabrication facility to print hundreds of thousands of tiny grooves on silicon wafers and then dice the wafers into individual chips. Our chips are inexpensive to manufacture and highly scalable. The fluidic environment in each channel allows individual molecules to move swiftly utilizing only the charge of DNA. Our nanochannels allow only a single linearized molecule at a time to enter a given channel while preventing the molecule from tangling or folding back on itself. Importantly, hundreds of thousands of molecules can move through hundreds of thousands of parallel nanochannels simultaneously, enabling extremely high-throughput processing on a single-molecule basis.

Saphyr Sample Prep and Labeling Kits

Our Bionano Prep Kits™ and labeling kits provide the critical reagents and protocols needed to extract and label high molecular weight, or HMW, DNA for use with the Saphyr™ system. These kits are optimized for performing our genome mapping applications on a variety of sample types.

Our workflow begins with the isolation of ultra-high molecular weight DNA. Our sample prep kits are optimized for isolating and purifying ultra-high molecular weight DNA in a process that is gentler than existing DNA extraction methods. The resulting purified DNA is millions of base pairs long and optimal for use with our systems. Each Bionano Prep Kit allows customers to perform five to 10 HMW DNA preps. Our kits and protocols enable the extraction of HMW DNA from a variety of sample types including soft or fibrous animal tissue, plant tissue, cell lines and human blood.

Our labeling reagents are optimized for applications on our genome mapping systems. Starting with HMW DNA purified using the appropriate Bionano Prep Kit, fluorescent labels are attached to specific sequence motifs. The result is uniquely identifiable genome-specific label patterns that enable de novo map assembly, anchoring sequencing contigs and discovery of structural variations as small as 500 base pairs to up to chromosome arm lengths.

Our newest and most powerful kit for DNA labeling, the Direct Label and Stain, or DLS, Kit is a proprietary, nondestructive chemistry for sequence motif labeling of genomic DNA that improves every aspect of our genome mapping. DLS uses a single direct-labeling enzymatic reaction to attach a fluorophore to the DNA at a specific 6-base pair sequence motif, yielding approximately 16 labels per 100,000 base pairs in the human genome. After labeling, the molecules are linearized in the Saphyr chip on the Saphyr instrument and imaged. Through the isolation, labeling and linearization steps, the molecules maintain an average length of around 250,000 base pairs. The label patterns on each molecule allow them to be uniquely identified and aligned in a pair-wise comparison against all other molecules imaged from the same sample.

Data Solutions

Our data solutions offering includes a complete suite of hardware and software for end-to-end experiment management, algorithms for assembling genome maps and algorithms and databases for bioinformatics processing, all of which is driven through convenient web-based management and monitoring tools.

Bionano Access is our web-based hub for Saphyr operations. It provides all the software that our customers need for experiment management and our structural variation analysis in one place. With Bionano Access our customers can:

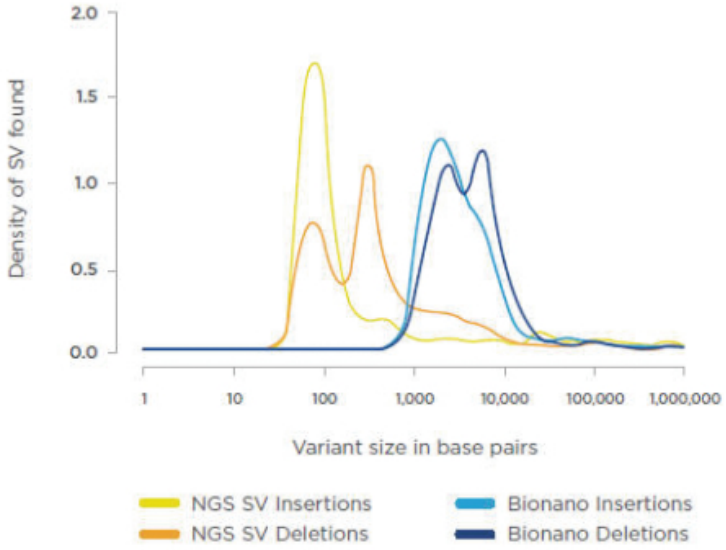
- set up runs and monitor real-time data quality metrics remotely to flag potential sample quality issues early;
- automatically start de novo assemblies and structural variation analysis when the desired amount of data has been collected;
- visualize and manipulate maps and structural variants; and
- analyze trios and clinical samples by filtering through uncommon variants to identify inherited and de novo variants, and export in a file format that is used consistently throughout the industry.

We have a suite of proprietary algorithms and databases that fully enable our proprietary bioinformatic and structural variation analysis pipelines. Using pairwise alignment of the single molecule images, consensus genome maps are constructed, refined, extended and merged. Molecules are then clustered into two alleles, and a diploid assembly is created to allow for heterozygous structural variation detection. Genome maps typically span entire chromosome arms in single, contiguous maps. Comparative analysis of maps reveals structural variation. Our customers use our variant annotation workflow to specifically uncover rare and sample-specific mutations. For example, to help a customer determine genomic variant frequency in a tumor, Saphyr compares the cancer sample structural calls against over 600,000 structural variations from over 160 humans with no evidence of diseases. To identify somatic mutations, the workflow can run comparisons of the tumor specimen against a control sample to determine whether the cancer mutations are present in low abundance among the control’s genome. Using this high through-put pipeline approach we can efficiently focus on dozens of clinically significant structural candidates for further analysis.

Our hardware solution includes the Saphyr Compute Server, which provides offers cluster-like performance in an affordable, compact solution and the Bionano Compute Server, which expands the analytical capacity of the suite of tools. With these solutions, our customers are capable of performing multiple simultaneous analyses and sustaining continuous throughput, which allows them to spend less time waiting for data, so they can focus on investigating results. We also offer a cloud-based solution for data analysis through a third party provider and expect to launch our own cloud-based solution by the fourth quarter of 2018.

The Saphyr System's Industry-Leading Sensitivity and Specificity

Our Saphyr system detects structural variations that Illumina's systems miss. As shown in the graphic below, the Garvan Institute of Medical Research generated data that we expect to be published which shows the density of structural variations found relative to the size of the structural variation found for our system (blue lines) against next-generation sequencing (Illumina; orange lines). Next-generation sequencing has a very significant deficiency in detecting structural variations. Given our system's ability to detect structural variations, it picks up essentially where next-generation sequencing drops off, as shown below.



Retaining long-range contiguity throughout the genome mapping process is critical for any comprehensive study of genome structure and function, particularly for the analysis of structural variation in complex genomes. Saphyr offers unmatched sensitivity for the detection of large structural variations greater than 500 base pairs. Saphyr's specific sensitivity percentages from recent studies are shown below:

- 99% sensitivity for homozygous insertions/deletions larger than 500 base pairs;
- 95% sensitivity for heterozygous insertions/deletions larger than 500 base pairs;
- 95% sensitivity for balanced and unbalanced translocations larger than 50,000 base pairs;
- 99% sensitivity for inversions larger than 30,000 base pairs;
- 97% sensitivity for duplications larger than 30,000 base pairs; and
- 97% sensitivity for copy number variants larger than 500,000 base pairs.

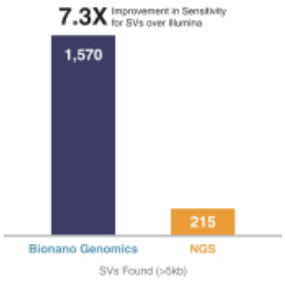
A study of Pacific Biosciences' long-read sequencing's ability to detect homozygous and heterozygous insertions and deletions was published recently. The sensitivity to detect homozygous structural variations using Pacific Biosciences was 87%, compared to 99% using Saphyr. The sensitivity to detect heterozygous structural variations using Pacific Biosciences was only 41%, which is less than half the 84% sensitivity for heterozygous structural variation detection using Saphyr. Even when the Pacific Biosciences structural variation calls were limited to insertions and deletions larger than 500 base pairs, the sensitivity for homozygous structural variations was only 81%, and for heterozygous structural variations was only 49%.

SV Sensitivity[1]		
	Bionano Genomics	Pacific Biosciences
Insertions		
Homozygous	99.3%	80.4%
Heterozygous	81.2%	39.7%
Deletions		
Homozygous	98.8%	82.4%
Heterozygous	87.9%	62.0%

[1]Sensitivity for variations >500 base pairs

Saphyr detects duplications over 30,000 base pairs, in direct or inverse orientation, with a sensitivity of 97%. Saphyr detects 99% of inversions of that same size range. Inversions are the invisible variants and have traditionally been the hardest to detect structural events. They are balanced, without gain or loss of sequence, and unlike translocations they do not create easily visible changes in genomic context. Inversions often escape detection by traditional cytogenetic techniques. Chromosomal microarrays cannot identify balanced events, and metaphase chromosome spreads can only visualize some megabase-size inversions. Next-generation sequencing approaches tend to miss inversions because reads from inside the inversion tend to map back to the reference without any indication that the orientation of the sequence has changed. Detection of the breakpoints often fails, especially if the inversion is flanked by segmental duplications, repeat sequences or other non-unique sequences. Saphyr's imaging of extremely long molecules overcomes these obstacles to identifying inversions.

In a separate study, our system detected seven times more structural variations larger than 5,000 base pairs compared to next-generation sequencing. Dr. Pui-Yan Kwok at the University of California, San Francisco, demonstrated the robustness of our system for genome-wide discovery of structural variations in a trio from the 1000 Genomes Project. Using our system, hundreds of insertions, deletions, and inversions greater than 5,000 base pairs were uncovered amounting to 7.3 times more than the large structural variation events detected by next-generation sequencing. Importantly, many of the structural variations that were found were in regions believed to contain functional elements leading to disruption of gene function or regulation.



Our Strengths

We have established ourselves as one of the leaders in the field of genome analysis, and we believe we are the industry's performance leader in structural variation detection. Below are our strengths that we believe will enable us to capture a significant portion of the genome analysis market and retain our leadership position in structural variation:

- ***Highly differentiated technology platform enables researchers and clinicians to obtain information that cannot be had systematically and cost efficiently from traditional technologies.*** Saphyr's unique ability to systematically and cost efficiently see structural variations across the genome from 500 base pairs to tens of millions of base pairs is unique in the industry. We believe this greater insight will facilitate a paradigm shift in healthcare from an emphasis on treatment with relatively untargeted therapies to a focus on earlier detection, more precise diagnosis and treatment with better targeted therapies.
- ***Validated solution recognized industry-wide.*** We have deep and expanding scientific validation. Our system has been cited in approximately 130 publications, and we believe our technology is becoming a vital tool in cutting-edge life sciences research.
- ***Strong installed base of premier customers.*** We have sold more than 90 of our systems to over 80 customers globally. Our customers include some of the world's most prominent clinical, translational research, basic research, academic and government institutions as well as leading pharmaceutical and diagnostic companies. Examples include Examples include Children's National Health System, DuPont Pioneer, Garvan Institute of Medical Research, Genentech, Icahn School of Medicine at Mount Sinai, McDonnell Genome Institute at Washington University, National Cancer Institute, National Institutes of Health, Pennsylvania State University and Salk Institute for Biological Studies.
- ***Attractive business model with a growing, high-margin recurring revenue component.*** As we continue to grow our installed base of Saphyr systems, optimize workflows and expand our structural variation detection capabilities, we expect to rapidly increase our high-margin revenues derived from consumables. The successful integration of our technology into our customers' projects provides ongoing sales of assays and consumables.
- ***Industry-leading intellectual property portfolio.*** We have developed a global patent portfolio that includes 43 issued patents across 14 patent families and an exclusively licensed portfolio of patents and applications from Princeton University, which includes 22 patents across two families. This global patent portfolio has filing dates ranging from 2001 to 2017. We have robust intellectual property protection surrounding our devices, systems, and methods for macromolecular analysis. Our ideation stems from our highly active research programs and results in our patent portfolio continually expanding at a significant pace.
- ***Highly experienced senior management team.*** We are led by a dedicated and highly experienced senior management team with significant industry experience and proven ability to develop novel solutions. Each of the members of our senior management has more than 20 years of relevant experience.

Our Strategy

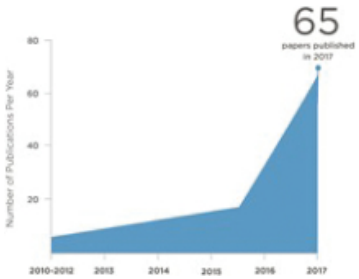
Our goal is to enable new research in genomics to allow greater insight into their role in human health in ways that have not been possible with any other current research and diagnostic technologies.

Our strategy to achieve this includes:

- ***Drive adoption of Saphyr in discovery research and cytogenetics markets.*** Saphyr has the potential to significantly expand the life science research market and genomics-based diagnostics market because of its unrivaled sensitivity, by enabling researchers to perform studies on structural variations that they

were previously unable to perform. We believe Saphyr has the capability to enable the development of a new category of diagnostic tests and tools.

- ***Support the publication of findings with Saphyr by our customers beyond the over 130 papers published to date.*** The chart below shows the annual number of publications released since 2010 which featured data generated by Saphyr and its predecessor system. Recently, the overall number of these publications has grown significantly. For example, of the over 130 papers published to date, approximately half were published in 2017 alone. We will continue to support and foster our customer base to help grow the number of publications featuring our systems' data. We believe that these publications are impactful as our customers' studies cover structural variations in areas of high unmet medical need, such as rare and undiagnosed pediatric diseases, muscular diseases, developmental delays and disorders, prostate cancer and leukemia.



- ***Expand gross margins through economies of scale and growing sales of consumables.*** Our overall gross margin has historically been driven by our instrument gross margin as the sales of our instruments have constituted the vast majority of our total revenues to date. Our instrument gross margin is significantly lower than our consumables gross margin. We expect our overall gross margin to expand in 2018 and beyond as:
  - We further negotiate with silicon fabrication manufacturers for better contract pricing of our consumables. As our manufacturing lot volumes increase, we expect to have lower costs of goods sold. This is driven by the pass along of some of the economies of scale of contract manufacturers that mainly operate in the ultra-high-volume silicon computer chip industry.
  - Consumables sales continue to represent the fastest growing component of overall revenues. As consumables growth continues to outpace instrument growth, we expect the proportion of our product mix which is higher gross margin to increase, thereby expanding our overall gross margin.
- ***Continue to innovate our products and technologies.*** We designed Saphyr to accommodate performance enhancements without the need for replacement of the entire instrument. For example, hardware upgrades and new consumables are made available to purchase by customers. We intend for these performance enhancements to be delivered on a regular basis. In addition, we periodically make available software upgrades to customers through download at no charge. We will continue to develop and refine our technologies to improve the ease of use of our Saphyr system and enable our existing installed systems to meaningfully increase sample throughput and sensitivity and specificity of structural variation detection.
- ***Partner with industry-leading companies and laboratories to accelerate adoption in clinical markets.*** Establish additional collaborations with customers to help drive validating studies. Expand partnership efforts with clinical diagnostic companies to commercialize LDTs in the U.S. as well as LDTs and approved tests outside the U.S.

Sales and Marketing

Our commercial team includes 16 individuals, including seven salespeople, two marketing personnel, and seven sales support personnel, including customer solutions personnel, field specialists and application specialists.

This commercial staff is primarily located in North America and Europe. Most of our sales support team is located at our headquarters in San Diego and some work remotely throughout the U.S., Europe and China.

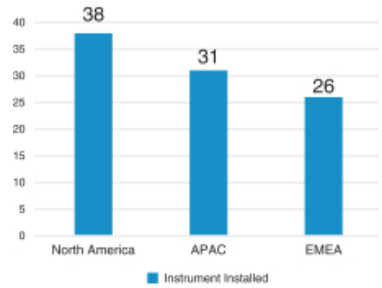
We sell our products through a direct sales force in North America and Europe. Our sales strategy involves the use of a combination of sales managers, sales representatives and field application specialists. Our direct sales force includes four salespeople located in the U.S. and three located in Europe. We expect to increase our sales force as we expand our business.

We sell our products through a network of distributors in the Asia-Pacific region and select other markets outside of North America and Europe. Specifically, we distribute our instruments and reagents via third-party distributors in markets such as China, Japan, South Korea, Singapore, Australia, India and South Africa. Four of our distributors are in China, one in Australia, one in Japan and one in South Korea.

The role of our sales managers and sales representatives is to educate customers on the advantages of Saphyr and the applications that our system makes possible. The role of our field application specialists is to provide on-site training and scientific technical support to prospective and existing customers. Our field application specialists are technical experts with advanced degrees, including four with Ph.D.s, and generally have extensive experience in academic research and core sequencing lab experience.

In addition, we maintain an applications lab team in San Diego, California composed of scientific experts who can transfer knowledge from the research and development team to the field application specialists. The applications lab team also runs foundational scientific collaborations and proof of principle studies, which help demonstrate the value of our product offering to prospective customers.

Our domestic and international sales force informs our current and potential customers of current product offerings, new product and new assay introductions, and technological advances in Saphyr systems, workflows, and notable research being performed by our customers or ourselves. As our primary point of contact in the marketplace, our sales force focuses on delivering a consistent marketing message and high level of customer service, while also attempting to help us better understand evolving market and customer needs.



We intend to significantly expand our sales, support, and marketing efforts in the future by expanding our direct footprint in North America and Europe as well as developing a more comprehensive support network in China where significant market opportunities exist. Additionally, we believe that there is significant opportunity in other European, South American, Asia-Pacific and Middle Eastern regions. We plan to expand into these regions via initial penetration with distributors.

Our sales and marketing efforts are targeted at key opinion leaders, laboratory directors and principal investigators at leading translational research, clinical institutions, governmental research institutions and pharmaceutical companies. In addition to our selling activities, we align with key opinion leaders at leading institutions and clinical research laboratories to help increase scientific and commercial awareness of our technology, demonstrate its benefits relative to existing technologies and accelerate its adoption. We also seek to increase awareness of our products through participation at trade shows, academic conferences, online webinars and dedicated scientific events attended by prominent users and prospective customers.

Our systems are relatively new to the life science marketplace and require a capital investment by our customers. The sales process typically involves numerous interactions and demonstrations with multiple people within an organization. Some potential customers conduct in-depth evaluations of the system including having us run experiments on in-house Saphyr systems. In addition, in most countries, sales to academic or governmental institutions require participation in a tender process involving preparation of extensive documentation and a lengthy review process. Because of these factors and the budget cycles of our customers, our sales cycle, the time from initial contact with a customer to our receipt of a purchase order, can often be nine to 12 months.

Manufacturing and Supply

Our manufacturing strategy is to outsource instrument and chip manufacturing and internally develop and assemble reagent kits in our own facility.

Instruments

Our Saphyr instrument is manufactured by a third party medical device manufacturer. Nearly complete Saphyr instruments are shipped by the manufacturer to us for final assembly and quality control testing. Upon completion, we ship directly to our customers' locations globally, or distributors' locations in the case of certain systems sold in the Asia-Pacific region. Installation of, and training on, our products is provided by our employees in the markets where we conduct direct sales, and by distributors in those markets where we operate with distributors.

We believe this manufacturing strategy is efficient and conserves capital. However, in the event it becomes necessary to utilize a different contract manufacturer for Saphyr, we would experience additional costs, delays and difficulties in doing so, and our business could be harmed.

This manufacturer actively manages obsolescence of all components in our system. This is done through their supply management process where we get notified of any parts that will become obsolete with enough lead time to identify alternatives.

Consumables

All of our chip consumables are produced by a third party manufacturer at its facility; however, we have established procedures for a replacement manufacturer if required. We complete final assembly and quality control assessments of our chips at our headquarters in San Diego.

Our reagents are sourced from a limited number of suppliers, including certain single source suppliers. Reagents include all components required to run a sample on Saphyr, such as capture and detector reagents, enzyme reagents and enzyme substrate. Although we believe that alternatives would be available, it would take time to identify and validate replacement reagents for our assay kits, which could negatively affect our ability to supply assay kits on a timely basis. Reagents are supplied through a single source supplier. This supplier requires a sufficient notification period to allow for supply continuity and the identification and technology transfer to a new supplier in the event either party wishes to terminate the relationship.

We actively manage component obsolescence by subscribing to our vendors' end-of-life notifications. If a vendor is unable to provide sufficient notification, we keep safety stock of the component to minimize disruption to operations.

Key Agreements

License Agreement with Princeton University

In January 2004, we entered into a license agreement, or the License Agreement, with Princeton University, or Princeton. Pursuant to the License Agreement, we received a worldwide, exclusive right and license to, among other things, manufacture and market products or services utilizing patents and inventions related to our sample preparation, DNA imaging and genomic data analysis platform and other key technology.

We are obligated to pay Princeton an annual license maintenance fee in the mid-four digits, which can be reduced by royalties paid to Princeton during the preceding 12 month period. We are also obligated to make royalty payments to Princeton equal to (i) a percentage in the mid-single digits of our and any of our sub-licensees' net sales of products covered by the License Agreement and (ii) a percentage in the low-single digits of our and any of our sub-licensees' revenue from services covered by the License Agreement. Our royalty obligations continue on a licensed product-by-licensed product and licensed service-by-licensed service basis, in every country of the world, until the later of the last sale of a licensed product or service or the expiration of all Princeton patent rights.

The term of the License Agreement will continue until all of our royalty payment obligations have expired, unless terminated earlier. Princeton may terminate the License Agreement upon written notice in the event of our material breach of the License Agreement if such breach remains uncured for 60 days. We may terminate the License Agreement without cause upon 60 days' advance written notice to Princeton.

Agreement for the Manufacture of Our Instruments

We have engaged a single third party manufacturer to produce and test our instruments on an as-ordered basis. The manufacturer of our instruments has no obligation to manufacture our instruments without a purchase order. In addition, this manufacturer has no obligation to maintain inventory in excess of any open purchase orders or materials in excess of the amount it reasonably determines will be consumed within 90 days. We are obligated to purchase any material deemed in excess pursuant to the agreement. The price we pay is determined according to a mutually agreed-upon pricing formula. We may terminate a purchase order by giving the manufacturer at least 30 days' written notice.

Agreement for the Manufacture of Our Chip Consumables

We have engaged a single third party manufacturer to manufacture our chip consumables used in our Saphyr system and provide engineering services to us. This third party has no obligation to manufacture our chip consumables without a purchase order. The prices and fees we pay are established in our agreement with this manufacturer or determined by the manufacturer pursuant if supported by appropriate information. Our agreement with this manufacturer automatically renews for successive one year terms unless a party notifies the other party in writing at least 30 days prior to the expiration of the then-current term. We may terminate an order of the agreement at any time upon 30 days' written notice.

Berry Genomics Agreement

We have entered into a collaboration agreement, or the Berry Agreement, with Berry Genomics Co., Ltd, or Berry. Under the terms of the Berry Agreement, Berry agreed to develop, market and commercialize a Berry-branded in-vitro diagnostic, or IVD, system (which is comprised of both kits and instruments) in the People's

Republic of China, or the PRC, in certain specified fields, as well as for clinical use by its partners. Pursuant to the Berry Agreement, Berry agreed to purchase certain of our components for use exclusively within the kits and instruments that make up the IVD system. Berry is then responsible for manufacturing the finished system, as well as for obtaining regulatory approvals for the sale of our components in the PRC. Per the Berry Agreement, we are obligated to provide the necessary support and documentation for the components, as well as provide training to enable Berry's after-sales installation and support for the IVD system.

Pursuant to the terms of the Berry Agreement, we granted to Berry and its affiliates, an irrevocable, exclusive, sublicensable, fully paid-up, royalty-free, license during the term of the agreement, solely to seek and obtain CFDA registration, manufacture, market, distribute and sell IVD kits and IVD instruments. We also have the right to all IVD system improvements. We have the first right, but not obligation, to take any measures we deem appropriate to enforce our intellectual property rights. We also agree to provide reasonable assistance related to such enforcement actions as Berry may request at the cost and expenses of Berry.

The Berry Agreement may be renewed by either party upon 90 days written notice and subject to the negotiation of an agreement facilitating such renewal. Either party may terminate the agreement for a material breach if such breach remains uncured for 30 days, or immediately if the breach is not curable. We may also immediately terminate the Berry Agreement if Berry fails to fulfill its minimum quantity purchase requirements.

Intellectual Property

Our core technology for nucleic acid research is related to methods and devices for non-sequencing based analysis of macromolecules such as nucleic acids. Using this technology, long (high-molecular weight) nucleic acids can be suitably labeled and elongated in order to ascertain structural information such as scaffold organization, copy number, and de novo analysis of genomic repeats that is not readily obtained with current sequencing-based approaches. We have secured and continue to pursue intellectual property rights globally, including rights related to analysis of nucleic acid molecules, as well as innovations in the molecular biology and bioinformatics spaces.

We have developed a global patent portfolio that includes 43 issued patents across 14 patent families and an exclusively licensed portfolio of patents and applications from Princeton University, which includes 22 patents across two families. This global patent portfolio has filing dates ranging from 2001 to 2017. The owned and licensed families contain issued patents and pending applications that relate to devices, systems, and methods for macromolecular analysis, and reflect our active and ongoing research programs. The commercial foci of these patent families are discussed below.

Commercial Focus	Number of Issued and Pending Patents
Nanochannel devices and systems	70
Methods of macromolecule analysis using nanochannel arrays	62
Methods of genetic detection and copy number analysis	28
Method of genomic sequence and epigenomic analysis.	48
Biomolecule isolation and processing for use in nanochannel analysis	3
Method of optimizing nanochannel analysis	6
Next-generation products	11

In addition to pursuing patents, we have taken steps to protect our intellectual property and proprietary technology by entering into confidentiality agreements and intellectual property assignment agreements with our employees, consultants, corporate partners and, as applicable, our advisors.

Government Regulation

Our products are currently intended for research use only, or RUO, applications, although our customers may use our products to develop their own products that are subject to regulation by the FDA. Although most products intended for RUO are not currently subject to clearance or approval by the FDA, RUO products fall under the FDA's jurisdiction if they are used for clinical rather than research purposes. Consequently, our products are labeled "For Research Use Only."

The FDA's 2013 Guidance for Industry and Food and Drug Administration Staff on "Distribution of In Vitro Diagnostic Products Labeled for Research Use Only or Investigational Use Only," or, the RUO/IUO Guidance, provides the FDA's thinking on when IVD products are properly labeled for RUO or for IUO. The RUO/IUO Guidance explains that the FDA will review the totality of the circumstances when evaluating whether equipment and testing components are properly labeled as RUO. Merely including a labeling statement that a product is intended for research use only will not necessarily exempt the device from the FDA's 510(k) clearance, premarket approval, or other requirements, if the circumstances surrounding the distribution of the product indicate that the manufacturer intends its product to be used for clinical diagnostic use. These circumstances may include written or verbal marketing claims or links to articles regarding a product's performance in clinical applications, a manufacturer's provision of technical support for clinical validation or clinical applications, or solicitation of business from clinical laboratories, all of which could be considered evidence of intended uses that conflict with RUO labeling.

When marketed for clinical diagnostic use, our products will be regulated by the FDA as medical devices. The FDA defines a medical device in part as an instrument, apparatus, implement, machine, contrivance, implant, in vitro reagent, or other similar or related article which is intended for the diagnosis of disease or other conditions or in the cure, mitigation, treatment, or prevention of disease in man. FDA regulates the development, testing, manufacturing, marketing, post-market surveillance, distribution, advertising and labeling of medical devices requires them to be register by the medical device manufacturer and listed as marketed products.

The FDA classifies medical devices into one of three classes on the basis of the intended use of the device, the risk associated with the use of the device for that indication, as determined by the FDA, and on the controls deemed by the FDA to be necessary to reasonably ensure their safety and effectiveness. Class I devices, which have the lowest level of risk associated with them, are subject to general controls. Class II devices are subject to general controls and special controls, including performance standards. Class III devices, which have the highest level of risk associated with them, are subject to general controls and premarket approval. Most Class I devices and some Class II devices are exempt from a requirement that the manufacturer submit a premarket notification, or 510(k), and receive clearance from the FDA which is otherwise a premarketing requirement for a Class II device. Class III devices may not be commercialized until a premarket approval application, or PMA, is submitted to and approved by the FDA.

510(k) Clearance Pathway

To obtain 510(k) clearance, a sponsor must submit to the FDA a premarket notification demonstrating that the device is substantially equivalent, or SE, to a device legally marketed in the U.S. for which a PMA was not required. The FDA is supposed to make a SE determination within 90 days of FDA's receipt of the 510(k), but it often takes longer if the FDA requests additional information. Most 510(k)s do not require supporting data from clinical trials, but the FDA may request such data.

Premarket Approval Pathway

A PMA must be submitted if a new device cannot be cleared through the 510(k) process. The PMA process is generally more complex, costly and time consuming than the 510(k) process. A PMA must be supported by extensive data including, but not limited to, technical, preclinical, clinical trials, manufacturing and labeling to

demonstrate to the FDA's satisfaction the safety and effectiveness of the device for its intended use. After a PMA is sufficiently complete, the FDA will accept the application for filing and begin an in-depth review of the submitted information. By statute, the FDA has 180 days to review the accepted application, although, review of the application generally can take between one and three years. During this review period, the FDA may request additional information or clarification of information already provided. Also during the review period, an advisory panel of experts from outside the FDA may be convened to review and evaluate the application and provide recommendations to the FDA as to the approvability of the device. In addition, the FDA will conduct a preapproval inspection of the manufacturing facility to ensure compliance with its quality system regulations, or QSRs. New premarket approval applications or premarket approval application supplements are also required for product modifications that affect the safety and efficacy of the device.

Clinical Trials

Clinical trials are usually required to support a PMA and are sometimes required for a 510(k). In the U.S., if the device is determined to present a "significant risk," the manufacturer may not begin a clinical trial until it submits an investigational device exemption application, or IDE, and obtains approval of the IDE from the FDA. These clinical trials are also subject to the review, approval and oversight of an institutional review board, or IRB, at each clinical trial site. The clinical trials must be conducted in accordance with the FDA's IDE regulations and good clinical practices. A clinical trial may be suspended by FDA, the sponsor or an IRB at its institution at any time for various reasons, including a belief that the risks to the study participants outweigh the benefits of participation in the trial. Even if a clinical trial is completed, the results may not demonstrate the safety and efficacy of a device to the satisfaction of the FDA, or may be equivocal or otherwise not be sufficient to obtain approval of a device.

After a medical device is placed on the market, numerous regulatory requirements apply. These include among other things:

- compliance with QSRs, which require manufacturers to follow stringent design, testing, control, documentation, record maintenance, including maintenance of complaint and related investigation files, and other quality assurance controls during the manufacturing process;
- reporting of device malfunctions, serious injuries or deaths;
- registration of the establishments where the devices are produced;
- labeling regulations, which prohibit the promotion of products for uncleared or unapproved uses; and
- medical device reporting obligations, which require that manufacturers investigate and report to the FDA adverse events, including deaths, or serious injuries that may have been or were caused by a medical device and malfunctions in the device that would likely cause or contribute to a death or serious injury if it were to recur.

Failure to comply with applicable regulatory requirements can result in enforcement action by the FDA, which may include sanctions, including but not limited to, warning letters; fines, injunctions, and civil penalties; recall or seizure of the device; operating restrictions, partial suspension or total shutdown of production; refusal to grant 510(k) clearance or PMA approvals of new devices; withdrawal of 510(k) clearance or PMA approvals; and civil or criminal prosecution. To ensure compliance with regulatory requirements, medical device manufacturers are subject to market surveillance and periodic, pre-scheduled and unannounced inspections by the FDA.

Laboratories that purchase certain of our products and perform clinical diagnostic testing are also subject to extensive regulation under the Clinical Laboratory Improvement Amendments of 1988, or CLIA, requiring clinical laboratories to meet specified standards in areas such as personnel qualifications, administration, participation in proficiency testing, patient test management, quality control, quality assurance and inspections.

Adverse interpretations of current CLIA regulations or future changes in CLIA regulations could have an adverse effect on sales of any affected products. Moreover, if we decide to operate our own clinical testing laboratory, we will be required to comply with CLIA. If, in the future, we operate our own clinical laboratory to perform clinical diagnostic testing, we would become subject to the Health Insurance Portability and Accountability Act of 1996, or HIPAA, as well as additional federal and state laws that impose a variety of fraud and abuse prohibitions on healthcare providers, including clinical laboratories.

Laboratory Developed Tests

Although the FDA has statutory authority to regulate medical devices, the FDA has historically exercised its enforcement discretion and not enforced applicable provisions of the FDC Act and FDA regulations with respect to laboratory developed tests, or LDTs, which are a subset of in vitro diagnostic tests that are intended for clinical use and designed, manufactured and used entirely within a single laboratory. The FDA does not consider devices to be LDTs if they are designed or manufactured completely, or partly, outside of the laboratory that offers and uses them. We sell our Saphyr system on an RUO basis to CLIA certified cytogenetics laboratories, which may use the system to develop LDTs.

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 draft guidance that sets forth a proposed risk-based regulatory framework that would apply such oversight to LDTs. The FDA has indicated that it does not intend to implement its proposed framework until the draft guidance documents are finalized. 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. A significant change in the way that the FDA regulates any LDTs that we, our collaborators or our customers develop using our technology could affect our business. If the FDA requires laboratories to undergo premarket review and comply with other applicable FDA requirements in the future, the cost and time required to commercialize an LDT will increase substantially, and may reduce the financial incentive for laboratories to develop LDTs, which could reduce demand for our instruments and our other products. In addition, if the FDA were to change the way that it regulates LDTs to require that we undergo pre-market review or comply with other applicable FDA requirements before we can sell our instruments or our other products to clinical cytogenics laboratories, our ability to sell our instruments and other products to this addressable market would be delayed, thereby impeding our ability to penetrate this market and generate revenue from sales of our instruments and our other products.

Europe/Rest of World Government Regulation

Whether or not we obtain FDA approval for a product, we must obtain the requisite approvals from regulatory authorities in non-U.S. countries prior to the commencement of clinical trials or marketing of our product for clinical diagnostic use in those countries. The regulations in other jurisdictions vary from those in the U.S. and may be easier or more difficult to satisfy and are subject to change. For example, the European Union recently published new regulations that will result in greater regulation of medical devices and IVDs. The IVD Regulation is significantly different from the IVD Directive that it replaces in that it will ensure that the new requirements apply uniformly and on the same schedule across the member states, include a risk-based classification system and increase the requirements for conformity assessment. The conformity assessment process results in the receipt of a CE designation which has been sufficient to begin marketing many types of IVDs. That process will become more difficult and costly to complete.

Other Governmental Regulation

We are subject to laws and regulations related to the protection of the environment, the health and safety of employees and the handling, transportation and disposal of medical specimens, infectious and hazardous waste and radioactive materials. For example, the U.S. Occupational Safety and Health Administration, has established

extensive requirements relating specifically to workplace safety for healthcare employers in the U.S. This includes requirements to develop and implement multi-faceted programs to protect workers from exposure to blood-borne pathogens, including preventing or minimizing any exposure through needle stick injuries. For purposes of transportation, some biological materials and laboratory supplies are classified as hazardous materials and are subject to regulation by one or more of the following agencies: the U.S. Department of Transportation, the U.S. Public Health Service, the U.S. Postal Service and the International Air Transport Association. We generally use third-party vendors to dispose of regulated medical waste, hazardous waste and radioactive materials that we may use during our research.

Coverage and Reimbursement

Currently, our product is for research use only, but clinical laboratories may acquire our instrumentation through a capital purchase or capital lease and use the Saphyr and direct label stain chemistry to create their own potentially reimbursable products, such as laboratory developed tests for in vitro diagnostics, Our customers may generate revenue for these testing services by seeking the necessary approval of their product from the FDA or the Center for Medicare and Medicaid Services, or CMS, along with coverage and reimbursement from third-party payors, including government health programs and private health plans. The ability of our customers to commercialize diagnostic tests based on our technology will depend in part on the extent to which coverage and reimbursement for these tests will be available from such third-party payors.

In the U.S., molecular testing laboratories have multiple options for reimbursement coding, but we expect that the primary codes used will be the genomic sequencing procedure codes, or GSPs. The American Medical Association, or AMA, added GSPs to its clinical laboratory fee schedule in 2015. In addition, CMS recently issued a coverage determination providing for the reimbursement of next-generation sequencing for certain cancer diagnostics using an FDA-approved in vitro diagnostic test. Private health plans often follow CMS to a substantial degree, and it is difficult to predict what CMS will decide with respect to reimbursement of any products our customers try to commercialize.

In Europe, coverage for molecular diagnostic testing is varied. Countries with statutory health insurance (e.g., Germany, France, The Netherlands) tend to be more progressive in technology adoption with favorable reimbursement for molecular diagnostic testing. In countries such as the United Kingdom with tax-based insurance, adoption and reimbursement for molecular diagnostic testing is not uniform and is influenced by local budgets.

Ultimately, coverage and reimbursement of new products is uncertain, and whether laboratories that use our instruments to develop their own products will attain coverage and adequate reimbursement is unknown. In the U.S., there is no uniform policy for determining coverage and reimbursement. Coverage can differ from payor to payor, and the process for determining whether a payor will provide coverage may be separate from the process for setting the reimbursement rate, In addition, the U.S. government, state legislatures and foreign governments have shown significant interest in implementing cost containment programs to limit the growth of government-paid health care costs, including price controls and restrictions on reimbursement.

Healthcare Reform

In the U.S. and abroad, there have been and continue to be a number of legislative initiatives to contain healthcare costs and change the way healthcare is financed. By way of example, in March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Affordability Reconciliation Act, collectively, the ACA, became law. The ACA is a sweeping law intended to broaden access to health insurance, reduce or constrain the growth of healthcare spending, enhance remedies against fraud and abuse, add new transparency requirements for the healthcare and health insurance industries, impose new taxes and fees on the health industry and impose additional health policy reforms. The ACA's provisions of importance to our business include, but are not limited to, a 2.3% excise tax on certain entities that manufactures or imports

medical devices offered for sale in the U.S., which has been suspended, but due to subsequent legislative amendments, will be automatically reinstated for medical device sales beginning January 1, 2020, unless Congress takes additional action to delay the implementation of the tax.

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 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 or otherwise circumvent some of the requirements for health insurance mandated by 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, two bills affecting the implementation of certain taxes under the ACA have been signed into law. The 2017 U.S. Tax Cuts and Jobs Act includes a provision repealing, effective January 1, 2019, the tax-based shared responsibility payment imposed by the ACA on certain individuals who fail to maintain qualifying health coverage for all or part of a year that is commonly referred to as the "individual mandate". Additionally, a 2018 continuing resolution on appropriations delays the implementation of certain ACA-mandated fees, including, without limitation, the medical device excise tax.

Further, other legislative changes have been proposed and adopted since the ACA was enacted. For example, on April 1, 2014, the Protecting Access to Medicare Act of 2014, or PAMA, was signed into law, which, among other things, significantly altered the payment methodology under the Medicare Clinical Laboratory Fee Schedule, or CLFS. PAMA requires certain laboratories performing clinical diagnostic laboratory tests to report to CMS the amounts paid by private payors for laboratory tests. Beginning on January 1, 2018, CMS has begun using reported private payor pricing to periodically revise payment rates under the CLFS.

We expect that additional state and federal healthcare reform measures will be adopted in the future, any of which could limit the amounts that federal and state governments will pay for healthcare products and services. In addition, sales of our tests outside of the U.S. will subject us to foreign regulatory requirements, which may also change over time.

Other Healthcare Laws

Our operations are directly or indirectly, through our customers, subject to various federal and state fraud and abuse laws, including, without limitation, the federal and state anti-kickback statutes and false claims laws. These laws may impact, among other things, our sales and marketing and education programs, and our financial and business relationships with researchers who use our instruments to develop marketed products. By way of example: the federal Anti-Kickback Statute prohibits, among other things, any person or entity from, among other things, knowingly and willfully soliciting, receiving, offering or paying any remuneration, directly or indirectly, to induce, or in return for, purchasing, leasing, ordering, or arranging for or recommending the purchase, lease, or order of any good, facility, item, or service reimbursable, in whole or in part, under a federal healthcare program; and the federal false claims laws, including, without limitation the federal civil False Claims Act, prohibit, among other things, anyone from knowingly and willingly presenting, or causing to be presented for payment, to the federal government (including Medicare and Medicaid) claims for reimbursement for, among other things, drugs or services that are false or fraudulent, claims for items or services not provided as claimed, or claims for medically unnecessary items or services. The ACA, among other things, amended the intent requirement of the federal Anti-Kickback Statute to clarify that 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 crime. In addition, the ACA clarifies that the government may assert that a claim that includes items or service resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the federal civil False Claims Act.

In addition, we may be subject to HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act and its implementing regulations, which imposes certain requirements relating to the

privacy, security and transmission of individually identifiable health information without appropriate authorization by entities subject to the rule, such as health plans, health care clearinghouses and certain health care providers and their business associates who create, use or disclose HIPAA protected health information on their behalf. We may also be subject to state and foreign laws that govern the privacy and security of health information in some circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

If our operations are found to be in violation of any of these laws, we may be subject to penalties, including, without limitation, civil, criminal, and administrative penalties, damages, fines, disgorgement, the curtailment or restructuring of our operations, exclusion from participation in federal and state healthcare programs, additional integrity oversight and reporting obligations, individual imprisonment, contractual damages, and reputational harm, any of which could adversely affect our ability to operate our business and our results of operations.

Employees

As of June 30, 2018, we had 65 employees, of which 28 work in sales, sales support and marketing, 28 work in research and development, four work in manufacturing and operations and five work in general and administrative. As of June 30, 2018, of our 65 employees, 57 were located in the U.S. and eight were employed outside the U.S. None of our employees is represented by a labor union or is subject to a collective bargaining agreement.

Facilities

We lease approximately 33,128 square feet of office, laboratory, and manufacturing space at our headquarters in San Diego, California, under a lease that expires on December 31, 2020. We believe that we will need additional space as we grow our operations, but believe that suitable additional or substitute space will be available to accommodate future growth of our business. We believe that our existing office, laboratory and manufacturing space will be sufficient to meet our needs in the interim.

MANAGEMENT

Executive Officers and Directors

The following table sets forth information regarding our directors and executive officers as of July 31, 2018.

Name	Age	Position
Executive Officers:		
R. Erik Holmlin, Ph.D.	50	President, Chief Executive Officer and Director
Mike Ward	47	Chief Financial Officer
Han Cao, Ph.D.	50	Chief Scientific Officer
Warren Robinson	49	Chief Commercial Officer
Mark Borodkin	44	Chief Operating Officer
Non-Employee Directors:		
David L. Barker, Ph.D.(1)(2)	77	Chairman, Director
Darren Cai, Ph.D.(1)	53	Director
Albert Luderer, Ph.D.(2)(3)	70	Director
Junfeng Wang(1)(3)	44	Director
Christopher Twomey(2)	58	Director
Quan Zhou(3)	43	Director

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

Executive Officers

R. Erik Holmlin, Ph.D. Dr. Holmlin has served as our President and Chief Executive Officer and as a member of our board of directors since January 2011. From June 2010 to February 2011, Dr. Holmlin served as president and Chief Executive Officer of GenVault Corporation, a private biosample management solutions company. Previously, Dr. Holmlin held positions as an entrepreneur in residence at Domain Associates, a dedicated life sciences venture capital firm; Chief Commercial Officer of Exiqon A/S, a publicly traded RNA research solutions company; founder and executive at GeneOhm Sciences, which was acquired by Becton Dickinson and Company; and a National Institutes of Health postdoctoral fellow at Harvard University. Until June 2016, Dr. Holmlin served as a director of Nanosphere, Inc., a publicly traded molecular diagnostic company, which was subsequently acquired by Luminex Corporation, a publicly traded biological testing company. Dr. Holmlin received his bachelor's degree in chemistry from Occidental College, his Ph.D. in chemistry from the California Institute of Technology and MBAs from University of California, Berkeley and Columbia University. Our board of directors believes that Dr. Holmlin's over 17 years of experience in the life sciences and health care industries, which includes the areas of technology development, product commercialization and venture financing, qualifies him to serve on our board of directors.

Mike Ward. Mr. Ward has served as our Chief Financial Officer since May 2018, and previously served as our Chief Business Officer from July 2017 and as our Vice President, Corporate Development since April 2014. From September 2009 to September 2013, Mr. Ward served as a Director and Vice President of the Private Equity and Venture Capital Investment team of Lurie Investment Fund. In addition, Mr. Ward previously served in investment banking positions at Leerink Partners, BMO Capital Markets, Dresdner Kleinwort Wasserstein, Prudential Securities and Credit Suisse. Mr. Ward has previously served on the boards of directors of public and private companies, including Nanosphere, Inc., CytoPherx, Inc., Aperion Biologics, Inc. and Impact Health, Inc. Mr. Ward has over 20 years of experience in the areas of investment banking, private equity and venture capital in the life sciences industry. Mr. Ward received his bachelor's degree in finance from the University of Illinois.

Han Cao, Ph.D. Dr. Cao founded Bionano in 2003 and has served as our Chief Scientific Officer since July 18, 2011. From January 2000 to October 2003, Dr. Cao worked as a Research Fellow in the Nanostructure lab in the Department of Engineering at Princeton University. Dr. Cao was a postdoctoral fellow from October 2000 to December 2003 at the Institute for Human Gene Therapy, in the Department of Molecular and Cellular Biology at the University of Pennsylvania Medical Center. Dr. Cao received his bachelor's degree in molecular and cellular biology from the University of Science and Technology of China and his Ph.D. in molecular biology from the University of Delaware.

Warren Robinson. Mr. Robinson has served as our Chief Commercial Officer since November 2017 and previously served as a Vice President with us in various sales and marketing functions from October 2015 to November 2017, including most recently as our Vice President of Global Sales and Marketing. From June 2013 to October 2015, Mr. Robinson served as Division Vice President of Aegis Chemical Solutions, LLC, a private oil production services company. Previously, Mr. Robinson held various leadership roles in sales-focused positions with Life Technologies Corporation, a publicly traded research tools development company acquired by Thermo Fisher Scientific Inc. in February 2014, and Invitrogen Corporation, a publicly traded research tools development company acquired by Life Technologies in January 2008. Mr. Robinson received his bachelor's degree in biochemistry from The University of Lethbridge, a research university located in Canada.

Mark Borodkin. Mr. Borodkin has served as our Chief Operating Officer since November 2017 and previously served as our Vice President, Product Development and Operations since October 2014. From December 2011 to August 2014, Mr. Borodkin served as the Senior Director of Engineering and Chief Product Officer at Brooks Life Science Systems, a provider of automation and cryogenic solutions for the life science industry, and from April 2009 to October 2011 as a Director of Engineering at Affymetrix, Inc., a private life science systems company that was acquired by Thermo Fisher Scientific in March 2016. From December 2007 to April 2009, Mr. Borodkin served as a Senior Manager and Core Team Leader of R&D for Siemens Healthcare Diagnostics, and for the prior 13 years, he developed sequencing and real-time PCR systems at Applied Biosystems, now a part of Thermo Fisher Scientific. Mr. Borodkin received both his bachelor's degree in electrical engineering and his master's degree in computer and systems engineering from Rensselaer Polytechnic Institute.

Non-Employee Directors

David L. Barker, Ph.D. Dr. Barker has served on our board of directors since May 2010, and as Chairman of our board of directors since August 2016. Dr. Barker also serves as a member of the board of directors of AmideBio, LLC, a private biotechnology company, Singular Genomics Systems, Inc., a private biotechnology company, and Integrated Diagnostics Inc., a private molecular diagnostics company. In addition, Dr. Barker is a scientific advisor to MiNDERA Corp., a private molecular dermatology company, and Luna DNA Inc., a private medical research database company. From January 2000 to January 2007, Dr. Barker served as Vice President and Chief Scientific Officer of Illumina, Inc., a public DNA sequencing technology company, and until May 2016 served as a member of the scientific advisory board of Illumina. Dr. Barker previously served as a member of the board of directors of IntegenX, Inc., a private Rapid human DNA identification technology company acquired by Thermo Fisher Scientific in May 2018, Zephyrus Biosciences, Inc., a private protein analysis research platform company acquired by Bio-Techne Corporation, a public life sciences company, in March 2016, ProteinSimple, a private protein analysis platform development company acquired by BioTechne in June 2014, and NextBio, a private genomic data analysis company acquired by Illumina in October 2013. Dr. Barker received his bachelor's degree in chemistry from the California Institute of Technology and a Ph.D. in biochemistry from Brandeis University. Our board of directors believes Dr. Barker's extensive experience in managing and leading early stage and established companies within the clinical diagnostic and biotechnology industries qualifies him to serve on our board of directors.

Darren Cai, Ph.D. Dr. Cai has served on our board of directors since September 2014. From April 2015 to April 2018, Dr. Cai served as a Managing Director of Legend Capital, a Chinese early stage and expansion stage

venture capital firm, and held a previous position as a Director of Legend Capital from October 2012. Dr. Cai also served as Chief Financial Officer of Beijing Genomics Institute, a genome sequencing company, from 2014 to 2016. During his tenure at Legend Capital, Dr. Cai focused on investment opportunities in the healthcare sector and led investment in more than 20 companies located in the U.S. and China. In addition, Dr. Cai previously served on the board of directors of Beijing Genomics Institute. Dr. Cai received his bachelor's degree in biophysics from the University of Science and Technology of China, MBA from Yale University and Ph.D. in vision science from the University of California, Berkeley. Our board of directors believes Dr. Cai's extensive experience in managing and developing investment and business opportunities within the health care sector qualifies him to serve on our board of directors.

Albert Luderer, Ph.D. Dr. Luderer has served on our board of directors since October 2011. Since March 2010, Dr. Luderer has served as Chief Executive Officer and a member of the board of directors of Integrated Diagnostics Inc., a private molecular diagnostics company. In addition, Dr. Luderer currently serves as the Chief Executive Officer and a member of the board of directors of Indi Molecular, Inc., synthetic antibody technology company, and as a the Executive Chairman of the board of directors of Prostate Management Diagnostics Inc. Dr. Luderer has over 30 years of experience in executive leadership roles in the areas of technology development, operations and business development. Dr. Luderer received his bachelor's degree in zoology from Drew University and his MS in immunochemistry and Ph.D. in immunogenics from Rutgers University. Our board of directors believes Dr. Luderer's experience in the biotechnology sector, with special focuses on technology, business development and commercialization, qualifies him to serve on our board of directors.

Junfeng Wang. Mr. Wang has served on our board of directors since February 2018. Since October 2009, Mr. Wang has served as a Managing Director of Legend Capital, and held previous positions with Legend Capital as Executive Director from October 2007, Senior Vice President from October 2006 and Vice President from October 2005. Through his tenure at Legend Capital, Mr. Wang has worked in the healthcare and chemical industries, developing research and investment expertise in growth capital investment. Mr. Wang received his bachelor's degree in polymer chemistry from Lanzhou University, a research university located in China, and his MBA from McMaster University, a research university located in Canada. Our board of directors believes Mr. Wang's extensive experience as a venture capital investor in the healthcare and chemical industries qualifies him to serve on our board of directors.

Christopher J. Twomey has served on our board of directors since July 2018. Since March 2006, Mr. Twomey has served as a director of Senomyx, Inc., a taste technologies company. Since August 2013, Mr. Twomey has served as a director and Chairman of the Audit Committee of Tandem Diabetes Care, Inc., a medical device company. From March 1990 to June 2007, Mr. Twomey served in various roles, including as Senior Vice President, Finance and Chief Financial Officer, at Biosite Incorporated, a medical diagnostics company. From October 1981 to March 1990, Mr. Twomey served as an audit manager for Ernst & Young, LLP. From July 2006 to March 2014, Mr. Twomey also served as a director and Chairman of the Audit Committee of Cadence Pharmaceuticals, Inc., a specialty pharmaceutical company that was acquired by Mallinckrodt plc in 2014. Mr. Twomey received his bachelors degree in Business Economics from the University of California at Santa Barbara. Mr. Twomey contributes substantial leadership skills and expertise in accounting and financial reporting that are especially valuable in his role as Chairman of our Audit Committee.

Quan Zhou. Mr. Zhou has served on our board of directors since February 2018. Since April 2016, Mr. Zhou has served as an Executive Director at Legend Capital, and held previous positions as Director from April 2015 and Vice President from October 2012. During his tenure at Legend Capital, Mr. Zhou has focused on the Medtech and diagnostics industries. Mr. Zhou received his bachelor's degree in Biology from the University of Science and Technology in China, his Masters in Neuroscience from the National University of Singapore, and his MBA from the China Europe International Business School. Our board of directors believes Mr. Zhou's extensive experience in investment in the healthcare sector qualifies him to serve on our board of directors.

There are no family relationships among any of our directors or executive officers.

Composition of Our Board of Directors

Our business and affairs are managed under the direction of our board of directors. Each of our current directors was elected to serve as a member of our board of directors pursuant to a stockholders agreement dated August 5, 2016, as amended, by and among us and certain of our stockholders. Pursuant to the stockholders agreement: (1) Dr. Holmlin was designated to serve on our board of directors as the then serving chief executive officer; (2) Mr. Zhou was designated by LC Fund VI, L.P., LC Parallel Fund VI, L.P. and LC HealthCare Fund I, and their affiliates, collectively referred to as LC, to serve on our board of directors as a representative of the holders of our Series C convertible preferred stock; (3) Mr. Wang was designated by LC to serve on our board of directors as a representative of the holders of our Series D-1 convertible preferred stock stockholders; and (4) Dr. Luderer, Dr. Barker, Dr. Cai and Mr. Twomey were designated to serve on our board of directors as independent directors. The stockholders agreement will terminate upon the closing of this offering, and thereafter no stockholder will have any special rights regarding the election or designation of the members of our board of directors.

We currently have seven directors, and 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 to be filed in connection with 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 Dr. Holmlin and Dr. Barker, and their terms will expire at the annual general meeting of stockholders to be held in 2019;
- the Class II directors will be Dr. Luderer and Mr. Zhou, and their terms will expire at the annual general meeting of stockholders to be held in 2020; and
- the Class III director will be Dr. Cai, Mr. Twomey and Mr. Wang, and their terms will expire at the annual general meeting of stockholders to be held in 2021.

Board Leadership Structure

Our board of directors is currently chaired by Dr. Barker, who has authority, among other things, to call and preside over board of directors meetings, to set meeting agendas and to determine materials to be distributed to the board of directors. Accordingly, the chairperson of our board of directors has substantial ability to shape the work of the board of directors. We believe that separation of the positions of chairperson and chief executive officer reinforces the independence of our board of directors in its oversight of our business and affairs. In addition, we have a separate chair for each committee of our board of directors. The chair of each committee is expected to report annually to our board of directors on the activities of their committee in fulfilling their responsibilities as detailed in their respective charters or specify any shortcomings should that be the case.

Role of the Board in Risk Oversight

The audit committee of our board of directors is primarily responsible for overseeing our risk management processes on behalf of our board of directors. Going forward, we expect that the audit committee will receive reports from management at least quarterly regarding our assessment of risks. In addition, the audit committee reports regularly to our board of directors, which also considers our risk profile. The audit committee and our board of directors focus on the most significant risks we face and our general risk management strategies. While our board of directors oversees our risk management, management is responsible for day-to-day risk management processes. Our board of directors expects management to consider risk and risk management in each business decision, to proactively develop and monitor risk management strategies and processes for

day-to-day activities and to effectively implement risk management strategies adopted by the audit committee and our board of directors. We believe this division of responsibilities is the most effective approach for addressing the risks we face and that our board of directors' leadership structure, which also emphasizes the independence of our board of directors in its oversight of its business and affairs, supports this approach.

Director Independence

Under the listing requirements and rules of Nasdaq, independent directors must comprise a majority of our board of directors as a listed company within one year of the listing date. Our board of directors has undertaken a review of the independence of each director. Based on information provided by each director concerning her or his background, employment and affiliations, our board of directors has determined that all of our directors, except Dr. Holmlin, are independent directors, as defined by Rule 5605(a)(2) of the Nasdaq Listing Rules.

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 Mr. Twomey, Dr. Luderer and Dr. Barker, each of whom our board of directors has determined 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. Twomey, who our board of directors has determined 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, the board of directors has examined each audit committee member's scope of experience and the nature of their employment in the corporate finance sector.

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 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.

Compensation Committee

Our compensation committee consists of Dr. Barker, Dr. Cai and Mr. Wang. The chair of our compensation committee is Dr. Barker. Our board of directors has determined that each member of the compensation committee is independent under the Nasdaq listing standards, a "non-employee director" as defined in Rule 16b-3 promulgated under the Exchange Act and an "outside director" as that term is defined in Section 162(m) of the Code.

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 approving the compensation of our chief executive officer, other executive officers and senior management;
- reviewing and recommending to our board of directors the compensation paid to our directors;
- reviewing and approving the compensation arrangements with our executive officers and other senior management;
- 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;
- reviewing, evaluating and recommending to our board of directors succession plans for our executive officers; and
- reviewing and establishing general policies relating to compensation and benefits of our employees, including our overall compensation philosophy.

Nominating and Corporate Governance Committee

Our nominating and corporate governance committee consists of Dr. Luderer, Mr. Wang and Mr. Zhou. The chair of our nominating and corporate governance committee is Dr. Luderer. Our board of directors has determined that each member of the nominating and corporate governance committee is independent under the Nasdaq listing standards, a non-employee director, and free from any relationship that would interfere with the exercise of his or her independent judgment.

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;
- instituting plans or programs for the continuing education of our board of directors and orientation of new 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 and management.

Code of Business Conduct and Ethics

Effective upon the completion of this offering, we will adopt a code of business conduct and ethics that applies to all our employees, officers and directors. This includes our principal executive officer, principal financial officer and principal accounting officer or controller, or persons performing similar functions. The full text of our code of business conduct and ethics will be posted on our website at www.bionanogenomics.com. We intend to disclose on our website any future amendments to our code of business conduct and ethics or waivers that exempt any principal executive officer, principal financial officer, principal accounting officer or controller, persons performing similar functions or our directors from provisions in our code of business conduct and ethics. Information contained in, 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.

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 calendar 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.

Director Compensation

Our board of directors adopted a non-employee director compensation policy in July 2018 that will become effective upon the execution and delivery of the underwriting agreement related to this offering and will be applicable to each member of our board of directors who is not also serving as an employee or consultant to the Company. This compensation policy provides that each such non-employee director will receive the following compensation for service on our board of directors:

- an annual cash retainer of $30,000;
- an additional annual cash retainer of $20,000 for service as chairman of the board of directors;
- an additional annual cash retainer of $15,000, $10,000 and $10,000 for service as chair of the audit committee, compensation committee and the nominating and corporate governance committee, respectively;
- an additional annual cash retainer of $7,500, $5,000 and $5,000 for service as a member of the audit committee, compensation committee and the nominating and corporate governance committee, respectively (not applicable to committee chairs);
- an initial option grant to purchase common stock with an aggregate Black-Scholes option value of $50,000 on the date of each such non-employee director's appointment to our board of directors; and
- an annual option grant to purchase common stock with an aggregate Black-Scholes option value of $35,000 on the date of each of our annual stockholder meetings.

Each of the option grants described above will be granted under our 2018 Plan, the terms of which are described in more detail below under "— Equity Benefit Plans — 2018 Equity Incentive Plan." Each such option grant will vest and become exercisable subject to the director's continuous service to us, provided that each option will vest in full upon a change in control (as defined in the 2018 Plan). The term of each option will be 10 years, subject to earlier termination as provided in the 2018 Plan, provided that upon a termination of service other than for death, disability or cause, the post-termination exercise period will be 12 months from the date of termination. An eligible director may decline all or any portion of his or her compensation by giving notice to the Company prior to the date cash may be paid or equity awards are to be granted, as the case may be.

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. Dr. Holmlin, our President and Chief Executive Officer, is also a director but did not receive any additional compensation for his service as a director. See the section titled “Executive Compensation” for more information regarding the compensation earned by Dr. Holmlin.

The following table sets forth in summary form information concerning the compensation that was earned by each of our non-employee directors during the year ended December 31, 2017:

NAME	FEES EARNED OR PAID IN CASH	OPTION AWARDS ($)(1)	TOTAL ($)
David L. Barker, Ph.D.	$ 30,000	$ 8,066	$ 38,066
Darren Cai, Ph.D.	$ —	$ —	$ —
Brian K. Halak, Ph.D.(2)	$ —	$ 5,500	$ 5,500
Albert Luderer, Ph.D.	$ 10,000	$ 5,500	$ 15,500
Junfeng Wang	$ —	$ —	$ —
Christopher Twomey(3)	$ —	$ —	$ —
Quan Zhou(4)	$ —	$ —	$ —

(1) The amounts reported reflect the aggregate grant date fair value of each equity award granted to our non-employee directors during the fiscal year ended December 31, 2017, as computed in accordance with Financial Accounting Standard Board Accounting Standards Codification Topic 718 for stock-based compensation transactions (ASC 718). Assumptions used in the calculation of these amounts are included in Note 2 to our financial statements for the fiscal year ended December 31, 2017. As required by SEC rules, the amounts shown exclude the impact of estimated forfeitures related to service-based vesting conditions. These amounts do not reflect the actual economic value that will be realized by our non-employee directors upon the vesting of the stock options, the exercise of the stock options, or the sale of the common stock underlying such stock options. As of December 31, 2017, the aggregate number of shares outstanding under all options to purchase our common stock held by our non-employee directors were: Dr. Barker, 13,392; Dr. Halak, 9,042; and Dr. Luderer, 9,182. None of our non-employee directors held unvested stock awards as of December 31, 2017.

(2) Dr. Halak resigned from our Board of Directors in May 2018.

(3) Mr. Twomey was appointed to our Board of Directors in July 2018.

(4) Mr. Zhou was appointed to our Board of Directors in July 2018.

EXECUTIVE COMPENSATION

Our named executive officers for the year ended December 31, 2017, consisting of our principal executive officer and the next two most highly compensated executive officers, were:

- R. Erik Holmlin, Ph.D., our Chief Executive Officer;
- Mike Ward, our Chief Financial Officer; and
- Han Cao, Ph.D., our Chief Scientific Officer.

Summary Compensation Table

The following table presents all of the compensation awarded to or earned by or paid to our named executive officers during the fiscal year ended December 31, 2017.

Name and Principal Position	Year	Salary ($)	Bonus ($)	Option Awards(1) ($)	Non-Equity Incentive Plan Compensation(2) ($)	All Other Compensation(3) ($)	Total ($)
R. Erik Holmlin, Ph.D. *Chief Executive Officer*	2017	378,628	—	93,786	118,132	14,784	605,330
Mike Ward *Chief Financial Officer*	2017	289,380	—	20,841	72,056	14,198	396,475
Han Cao, Ph.D. *Chief Scientific Officer*	2017	300,451	—	31,262	45,518	14,468	391,699

(1) In accordance with SEC rules, this column reflects the aggregate grant date fair value of stock options granted to our named executive officers during fiscal year ended December 31, 2017 under our 2006 Plan, computed in accordance with ASC 718. The valuation assumptions used in calculating the fair value of the stock options are included in Note 2 to our financial statements included elsewhere in this prospectus. These amounts do not reflect the actual economic value that may be realized by the named executive officer upon the vesting of the stock options, the exercise of the stock options, or the sale of the common stock underlying such stock options.

(2) Amounts reported represent bonuses earned for 2017 and paid in 2018 at the discretion of our board of directors.

(3) Amounts reflect the following: for Mr. Holmlin, $14,424 for 401(k) matching contributions and $360 for life insurance premiums; for Mr. Ward, $13,838 for 401(k) matching contributions and $360 for life insurance premiums; for Mr. Cao, $14,108 for 401(k) matching contributions and $360 for life insurance premiums.

Annual Base Salary

The compensation of our named executive officers is generally determined and approved by our board of directors, based on the recommendation of the compensation committee of our board of directors. The 2017 base salaries that became effective as of February 7, 2017 were as follows:

NAME	2017 BASE SALARY ($)
R. Erik Holmlin, Ph.D.	378,628
Mike Ward	289,380
Han Cao, Ph.D.	300,451

Bonus Opportunity

In addition to base salaries, our named executive officers are eligible to receive annual performance-based cash bonuses, which are designed to provide appropriate incentives to our executives to achieve defined annual

performance goals and to reward our executives for individual achievement towards these goals. The annual performance-based bonus each named executive officer is eligible to receive is generally based on the extent to which we achieve the corporate goals that our compensation committee establishes each year and, for all except Dr. Holmlin, the individual's contributions to such achievements. Dr. Holmlin's payout is based entirely on Company performance, Dr. Cao's payout is based on Company performance (25% weighting) and his individual performance (75% weighting), and Mr. Ward's payout is based on Company performance (50% weighting) and his individual performance (50% weighting). At the end of the year, our board of directors reviews each executive's performance and determines the actual bonus payout to be awarded to each of our named executive officers.

For 2017, the target bonus for Dr. Holmlin was 40% of base salary, for Dr. Cao was 20% of base salary and for Mr. Ward was 30% of base salary. Our corporate performance objectives for 2017, as established by our compensation committee, included achievement of our 2017 operating plan, launch of our Saphyr instrument, accomplishment of product development milestones, entry into product development and marketing arrangements and securing additional financing. In March 2018, our board of directors approved a 78% overall achievement level of our corporate goals and awarded bonuses to our named executive officers based on Company achievements and, except for Dr. Holmlin, on individual performance in 2017.

Equity-Based Incentive Awards

We believe that our ability to grant equity-based awards is a valuable and necessary compensation tool that aligns the long-term financial interests of our employees, consultants and directors with the financial interests of our stockholders. In addition, we believe that our ability to grant equity-based awards helps us to attract, retain and motivate employees, consultants and directors, and encourages them to devote their best efforts to our business and financial success. Our board of directors is responsible for approving equity grants. Vesting of equity awards is generally tied to continuous service with us and serves as an additional retention measure. Our executives generally are awarded an initial new hire grant upon commencement of employment. Additional grants may occur periodically in order to specifically incentivize executives with respect to achieving certain corporate goals or to reward executives for exceptional performance.

Prior to this offering, we have granted all equity awards pursuant to the 2006 Plan, the terms of which are described below under "—Equity Benefit Plans." All options are granted with a per share exercise price equal to no less than the fair market value of a share of our common stock on the date of the grant of such award. Generally our stock option awards vest over a three-year period subject to the holder's continuous service to us.

In February 2017, our board of directors granted options to purchase 153,988 shares to Dr. Holmlin, 51,328 shares to Dr. Cao and 34,219 shares to Mr. Ward. Each option has an exercise price of $1.28 per share and vests as follows: 25% of the shares subject to the option are fully vested and 6.25% of the shares subject to the option vest at the end of each three month anniversary of vesting commencement date, subject to single trigger acceleration of vesting in connection with a change of control, provided in each case that the holder is then providing services to us in accordance with the terms of the 2006 Plan. For additional information, please see below under "—Outstanding Equity Awards at Fiscal Year-End."

In August 2018, our board of directors amended all outstanding options held as of such date by Dr. Holmlin and Mr. Ward such that, contingent upon and following the date of the underwriting agreement related to this offering, the vesting of all such awards will be suspended until such time as the closing price of our common stock is at least $12.00 per share for 90 consecutive trading days, at which point the suspension will automatically and immediately lapse and the awards will vest to the extent they otherwise would have vested pursuant to their terms and notwithstanding the suspension and will continue to vest thereafter under their original vesting schedules. In addition, the suspension will lapse as to the awards held by Dr. Holmlin or Mr. Ward upon Dr. Holmlin's or Mr. Ward's respective death, disability or upon a change in control of the Company, as such terms are defined in the 2018 Plan.

Agreements with Our Named Executive Officers

Below are descriptions of our employment agreements with our named executive officers. For a discussion of the severance pay and other benefits to be provided in connection with a termination of employment and/or a change in control under the arrangements with our named executive officers, please see "—Potential Payments upon Termination or Change in Control" below.

Dr. Holmlin. We entered into an employment agreement with Dr. Holmlin in January 2011, as amended in March 2011 and in November 2017, which governs the current terms of his employment with us. Pursuant to the agreement, as amended, Dr. Holmlin was entitled to an initial annual base salary of $315,000 and is eligible to receive an annual performance bonus with a target of 40% of his base salary, with a higher amount possible if goals exceeding target are achieved, as determined by our compensation committee and subject to approval by our board of directors. In addition, Dr. Holmlin was eligible to receive an option to purchase shares of the Company's common stock representing 5.0% of the fully-diluted equity shares immediately subsequent to the closing of a Series B transaction, which were equal to 2,992 shares of our common stock and were granted in 2011. In addition, Dr. Holmlin's agreement provided for additional options to be granted in connection with specified events in order to maintain Dr. Holmlin's ownership percentage, pursuant to which Dr. Holmlin was granted additional options to purchase 1,115 shares in 2012 and 2,546 shares in 2015. No obligations to make additional grants to maintain Dr. Holmlin's ownership percentage remain under his employment agreement. Dr. Holmlin's employment is at will.

Mr. Ward. We entered into an employment agreement with Mr. Ward in July 2016, which governs the current terms of his employment with us. Pursuant to the agreement, Mr. Ward was entitled to an initial annual base salary of $278,250 and is eligible to receive an annual performance bonus with a target amount of up to 30% of his base salary, as determined by our board of directors. Mr. Ward's employment is at will.

Dr. Cao. We entered into an employment agreement with Dr. Cao in July 2011, as amended in November 2017, which governs the current terms of his employment with us. Pursuant to the agreement, Dr. Cao was entitled to an initial annual base salary of $250,000 and a one-time signing bonus of $40,000 in cash. Dr. Cao received certain benefits in connection with his relocation, which were paid in 2012. Dr. Cao is eligible to receive an annual performance bonus with a target amount of 20% of his base salary based on the Company's performance (25% weighting) and Dr. Cao's individual performance (75% weighting), as determined by our board of directors. In addition, Dr. Cao was eligible to receive an option to purchase a number of shares of the Company's common stock that, together with shares and/or options then owned by Dr. Cao and the shares of Series B preferred stock of the Company that was to be issued to Dr. Cao as described in his employment agreement, represented no less than 7.5% of the total outstanding shares of the common stock of the Company on a fully diluted basis, which was equal to 2,344 shares of our common stock and was granted in 2011. No obligations to make additional grants to maintain Dr. Cao's ownership percentage remain under his employment agreement. Dr. Cao was also entitled to a bonus consisting of 240,800 shares of Series B preferred stock of the Company pursuant to the terms of a restricted stock purchase agreement entered into in August 2011. Dr. Cao's employment is at will.

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 term of service, including unpaid salary and unused vacation. In addition, each of our named executive officers is eligible to receive certain benefits pursuant to his employment agreement with us, as described below. For the definitions of "cause," "good reason" and "disability" referenced below, please refer to the individual employment agreements with each of our named executive officers.

Dr. Holmlin. Upon Dr. Holmlin's termination for any reason other than death, disability, cause or resignation without good reason, and subject to Dr. Holmlin's execution of a release, Dr. Holmlin shall be

eligible to receive (i) a lump sum amount equal to nine months of base salary, (ii) accelerated vesting of any options or restricted shares that would have vested within 18 months after the date of termination and (iii) premiums for continued health coverage for nine months following the date of termination, or until Dr. Holmlin is no longer eligible for continuation coverage, whichever is earlier. In the event of termination due to disability, and subject to Dr. Holmlin's execution of a release, Dr. Holmlin shall be eligible to receive accelerated vesting in full for any unvested portion of the options granted pursuant to his agreement. In the event of a deemed liquidation event (as defined in Dr. Holmlin's employment agreement), the options granted to Dr. Holmlin pursuant to his agreement shall vest in full.

Mr. Ward. Upon termination without cause, and subject to Mr. Ward's execution of a release, Mr. Ward will be eligible to receive (i) six months of continued base salary payments at the rate in effect at the time of termination and (ii) premiums for continued health coverage for six months following the date of termination or until Mr. Ward is no longer eligible for continuation coverage or he becomes eligible for new healthcare eligibility available through new employment, whichever is earlier.

Dr. Cao. Upon Dr. Cao's termination without cause or resignation for good reason, and subject to Dr. Cao's execution of a release, Dr. Cao will be eligible to receive (i) six months of continued base salary, to be paid on the Company's normal pay days commencing with the first regular payroll date of the Company following the effective date of the release, and (ii) premiums for continued health coverage for a period of six months following the date of termination or until Dr. Cao is no longer eligible for such coverage, whichever is earlier. In addition, Dr. Cao's unvested options shall immediately vest as if Dr. Cao had been employed for an additional six months from the date of termination, since more than two years has passed from start of Dr. Cao's employment. Upon Dr. Cao's termination by death or disability, Dr. Cao's unvested options shall immediately vest as if Dr. Cao had been employed for an additional six months from the date of termination, since more than two years has passed from the start of Dr. Cao's employment.

Each of our named executive officers holds stock options under the 2006 Plan that were granted subject to the general terms of the 2006 Plan and the form of stock option agreement. A description of the termination and change of control provisions in the 2006 Plan and stock options granted thereunder is provided below under "—Equity Benefit Plans" and the specific vesting terms of each named executive officer's stock options are described below under "—Outstanding Equity Awards at Fiscal Year-End."

Outstanding Equity Awards at Fiscal Year-End

The following table presents information regarding outstanding equity awards held by our named executive officers as of December 31, 2017.

		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
R. Erik Holmlin, Ph.D(5).	2/7/2017(3)	67,369	86,619	$ 1.28	2/6/2027
	1/29/2015(4)	3,257	1,480	$ 64.20	1/28/2025
	1/29/2015	2,546	—	$ 64.20	1/28/2025
	6/20/2012	1,115	—	$ 68.48	6/19/2022
	5/16/2011	2,992	—	$ 42.80	5/15/2021
Mike Ward(5)	2/7/2017(3)	14,971	19,248	$ 1.28	2/6/2027
	1/29/2015(4)	697	317	$ 64.20	1/28/2025
	4/21/2014(4)	535	76	$ 81.32	4/20/2024
Han Cao, Ph.D.	2/7/2017(3)	22,456	28,872	$ 1.28	2/6/2027
	1/29/2015(4)	1,758	799	$ 64.20	1/28/2025
	1/29/2015	1,599	—	$ 64.20	1/28/2025
	8/10/2011	2,344	—	$ 42.80	8/9/2021
	4/2/2010	46	—	$ 38.52	4/1/2020
	1/15/2009	46	—	$291.04	1/14/2019

(1) All of the option awards were granted under the 2006 Plan, the terms of which plan is described below under "—Equity Benefit 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.

(3) Each option award vests as follows: 25% of the shares subject to the option are fully vested and 6.25% of the shares subject to the option vest at the end of each three month anniversary of the vesting commencement date, subject to single trigger acceleration of vesting in connection with a change of control, provided in each case that the holder is then providing services to us in accordance with the terms of the 2006 Plan.

(4) Each option award vests as follows: 25% of the shares subject to the option shall vest at the end of the first anniversary of the vesting commencement date, and 6.25% of the shares subject to the option vest at the end of each three month anniversary of the vesting commencement date, subject to single trigger acceleration of vesting in connection with a change of control, provided in each case that the holder is then providing services to us in accordance with the terms of the 2006 Plan.

(5) All outstanding options held by Dr. Holmlin and Mr. Ward were amended by our board of directors in August 2018 to suspend the vesting until the achievement of certain milestones, as further described above under "—Equity-Based Incentive Awards."

Perquisites, Health, Welfare and Retirement 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, accidental death and dismemberment insurance for all of our employees, including our named executive officers. In addition, we provide a 401(k) plan to our employees, including our named executive officers, as discussed in the section below entitled "—401(k) Plan." We generally do not provide perquisites or personal benefits to our named executive officers.

Nonqualified Deferred Compensation

Our named executive officers did not participate in, or earn any benefits under, a nonqualified deferred compensation plan sponsored by us during the fiscal year ended December 31, 2017. Our board of directors may elect to provide our officers and other employees with nonqualified defined contribution or other nonqualified deferred compensation benefits in the future if it determines that doing so is in our best interests.

401(k) Plan

We maintain a defined contribution employee retirement plan, or 401(k) plan, for our employees. Our named executive officers are eligible to participate in the 401(k) plan on the same basis as our other employees. The 401(k) plan is intended to qualify as a tax-qualified plan under Section 401(k) of the Code. The plan permits us to make discretionary contributions, including matching contributions and discretionary profit sharing contributions. The 401(k) plan currently does not offer the ability to invest in our securities.

Equity Benefit Plans

The principal features of our equity plans are summarized below. These summaries are qualified in their entirety by reference to the actual text of the plans, which are filed as exhibits to the registration statement of which this prospectus is a part.

2018 Equity Incentive Plan

Our board of directors adopted our 2018 Plan in July 2018 and our stockholders approved our 2018 Plan in July 2018. Our 2018 Plan provides for the grant of incentive stock options, or ISOs, within the meaning of Section 422 of the Code, to employees, including employees of any parent or subsidiary, and for the grant of nonstatutory stock options, or NSOs, stock appreciation rights, restricted stock awards, restricted stock unit awards, performance stock awards, performance cash awards and other forms of stock awards to employees, directors and consultants, including employees and consultants of our affiliates. Our 2018 Plan is a successor to and continuation of our 2006 Plan. No stock awards may be granted under the 2018 Plan until the date of the underwriting agreement related to this offering.

Authorized Shares. Initially, the maximum number of shares of our common stock that may be issued under our 2018 Plan after it becomes effective will be 1,499,454 shares, which is the sum of (1) 1,000,000 new shares, plus (2) the number of shares (not to exceed 499,454 shares) (i) that remain available for the issuance of awards under our 2006 Plan at the time our 2018 Plan becomes effective, and (ii) any shares subject to outstanding stock options or other stock awards that were granted under our 2006 Plan that are forfeited, terminate, expire, are reacquired, withheld (or not issued) to satisfy a tax withholding obligation or the purchase or exercise price. In addition, the number of shares of our common stock reserved for issuance under our 2018 Plan will automatically increase on January 1 of each calendar year, starting on January 1, 2019 (assuming the 2018 Plan becomes effective in 2018) through January 1, 2028, in an amount equal to 5% of the total number of shares of our capital stock outstanding on the last day of the calendar month before the date of each automatic increase, or a lesser number of shares determined by our board of directors. The maximum number of shares of our common stock that may be issued on the exercise of ISOs under our 2018 Plan is 2,998,908.

Shares subject to stock awards granted under our 2018 Plan that expire or terminate without being exercised in full, or that are paid out in cash rather than in shares, do not reduce the number of shares available for issuance under our 2018 Plan. Additionally, shares become available for future grant under our 2018 Plan if they were issued under stock awards under our 2018 Plan if we repurchase them or they are forfeited. This includes shares used to pay the exercise price of a stock award or to satisfy the tax withholding obligations related to a stock award.

The maximum number of shares of common stock subject to stock awards granted under the 2018 Plan or otherwise during a single 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 $500,000 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 of directors, $800,000.

Plan Administration. Our board of directors, or a duly authorized committee of our board of directors, will administer our 2018 Plan. Our board of directors may also delegate to one or more of our officers the authority to (1) designate employees (other than officers) to receive specified stock awards and (2) determine the number of shares subject to such stock awards. Under our 2018 Plan, our board of directors has the authority to determine and amend the terms of awards and underlying agreements, including:

- recipients;
- the exercise, purchase or strike price of stock awards, if any;
- the number of shares subject to each stock award;
- the vesting schedule applicable to the awards, together with any vesting acceleration; and
- the form of consideration, if any, payable on exercise or settlement of the award.

Under the 2018 Plan, the board of directors also generally has the authority to effect, with the consent of any adversely affected participant:

- the reduction of the exercise, purchase, or strike price of any outstanding award;
- the cancellation of any outstanding award and the grant in substitution therefore of other awards, cash, or other consideration; or
- any other action that is treated as a repricing under generally accepted accounting principles.

Stock Options. ISOs and NSOs are granted under stock option agreements adopted by the plan administrator. The plan administrator determines the exercise price for stock options, within the terms and conditions of the 2018 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 2018 Plan vest at the rate specified in the stock option agreement as determined by the plan administrator.

Tax Limitations on Incentive Stock Options. 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 award 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 generally be treated as NSOs. No ISO 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 affiliates 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 Unit Awards. Restricted stock units are granted under restricted stock unit award agreements adopted by the plan administrator. Restricted stock units may be granted in consideration for any form of legal consideration that may be acceptable to our board of directors and permissible under applicable law. A restricted stock unit 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 agreement. Additionally, dividend equivalents may be credited in respect of shares covered by a restricted stock unit. Except as otherwise provided in the applicable award agreement, restricted stock units that have not vested will be forfeited once the participant's continuous service ends for any reason.

Restricted Stock Awards. Restricted stock awards are granted under restricted stock award agreements adopted by the plan administrator. A restricted stock award may be awarded in consideration for cash, check,

bank draft or money order, past or future services to us, or any other form of legal consideration that may be acceptable to our board of directors and permissible under applicable law. The plan administrator determines the terms and conditions of restricted stock awards, including vesting and forfeiture terms. If a participant's service relationship with us ends for any reason, we may receive any or all of the shares of common stock held by the participant that have not vested as of the date the participant terminates service with us through a forfeiture condition or a repurchase right.

Stock Appreciation Rights. Stock appreciation rights are granted under stock appreciation grant agreements adopted by the plan administrator. The plan administrator determines the purchase price or 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. A stock appreciation right granted under the 2018 Plan vests at the rate specified in the stock appreciation right agreement as determined by the plan administrator.

Performance Awards. The 2018 Plan permits the grant of performance-based stock and cash awards. Our compensation committee may structure awards so that the stock or cash will be issued or paid only following the achievement of certain pre-established performance goals during a designated performance period.

The performance goals that may be selected include one or more of the following: (i) sales; (ii) revenues; (iii) assets; (iv) expenses; (v) market penetration or expansion; (vi) earnings from operations; (vii) earnings before or after deduction for all or any portion of interest, taxes, depreciation, amortization, incentives, service fees or extraordinary or special items, whether or not on a continuing operations or an aggregate or per share basis; (viii) net income or net income per common share (basic or diluted); (ix) return on equity, investment, capital or assets; (x) one or more operating ratios; (xi) borrowing levels, leverage ratios or credit rating; (xii) market share; (xiii) capital expenditures; (xiv) cash flow, free cash flow, cash flow return on investment, or net cash provided by operations; (xv) stock price, dividends or total stockholder return; (xvi) development of new technologies or products; (xvii) sales of particular products or services; (xviii) economic value created or added; (xix) operating margin or profit margin; (xx) customer acquisition or retention; (xxi) raising or refinancing of capital; (xxii) successful hiring of key individuals; (xxiii) resolution of significant litigation; (xxiv) acquisitions and divestitures (in whole or in part); (xxv) joint ventures and strategic alliances; (xxvi) spin-offs, split-ups and the like; (xxvii) reorganizations; (xxviii) recapitalizations, restructurings, financings (issuance of debt or equity) or refinancings; (xxix) or strategic business criteria, consisting of one or more objectives based on the following goals: achievement of timely development, design management or enrollment, meeting specified market penetration or value added, payor acceptance, patient adherence, peer reviewed publications, issuance of new patents, establishment of or securing of licenses to intellectual property, product development or introduction (including, without limitation, discovery of novel products, maintenance of multiple products in pipeline, product launch or other product development milestones), geographic business expansion, cost targets, cost reductions or savings, customer satisfaction, operating efficiency, acquisition or retention, employee satisfaction, information technology, corporate development (including, without limitation, licenses, innovation, research or establishment of third party collaborations), manufacturing or process development, legal compliance or risk reduction, patent application or issuance goals, or goals relating to acquisitions, divestitures or other business combinations (in whole or in part), joint ventures or strategic alliances; and (xxx) other measures of performance selected by the board of directors.

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. Our board of directors is authorized at any time in its sole discretion, to adjust or modify the calculation of a performance goal for such performance period in order to prevent the dilution or enlargement of the rights of participants, (a) in the event of, or in anticipation of, any unusual or extraordinary corporate item, transaction, event or development; (b) in recognition of, or in anticipation of, any other unusual or nonrecurring events affecting the Company, or the financial statements of the Company in response to, or in anticipation of, changes in applicable laws, regulations, accounting principles, or business conditions; or (c) in view of the board of

director's assessment of the business strategy of the Company, performance of comparable organizations, economic and business conditions, and any other circumstances deemed relevant. Specifically, the board of directors is authorized to make adjustment in the method of calculating attainment of performance goals and objectives for a performance period as follows: (i) to exclude the dilutive effects of acquisitions or joint ventures; (ii) 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; and (iii) 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. In addition, the board of directors is authorized to make adjustment in the method of calculating attainment of performance goals and objectives for a performance period as follows: (i) to exclude restructuring and/or other nonrecurring charges; (ii) to exclude exchange rate effects, as applicable, for non-U.S. dollar denominated net sales and operating earnings; (iii) to exclude the effects of changes to generally accepted accounting standards required by the Financial Accounting Standards Board; (iv) to exclude the effects of any items that are "unusual" in nature or occur "infrequently" as determined under generally accepted accounting principles; (v) to exclude the effects to any statutory adjustments to corporate tax rates; and (vi) to make other appropriate adjustments selected by the board of directors.

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 there is a specified type of change in our capital structure, such as a stock split, reverse stock split, or recapitalization, appropriate adjustments will be made to (1) the class and maximum number of shares reserved for issuance under the 2018 Plan, (2) the class and maximum number of shares by which the share reserve may increase automatically each year, (3) the class and maximum number of shares that may be issued on the exercise of incentive stock options, (4) the class and maximum number of shares subject to stock awards that may be awarded to any non-employee director under the 2018 Plan, and (5) the class and number of shares and exercise price, strike price, or purchase price, if applicable, of all outstanding stock awards.

Corporate Transactions. Our 2018 Plan provides that in the event of certain specified significant corporate transactions (or a change in control, as defined below), unless otherwise provided in an award agreement or other written agreement between us and the award holder, the administrator may take one or more of the following actions with respect to such stock awards:

- arrange for the assumption, continuation, or substitution of a stock award by a successor corporation;
- arrange for the assignment of any reacquisition or repurchase rights held by us to a successor corporation;
- accelerate the vesting, in whole or in part, of the stock award and provide for its termination if not exercised (if applicable) at or before the effective time of the transaction;
- arrange for the lapse, in whole or in part, of any reacquisition or repurchase rights held by us;
- cancel or arrange for the cancellation of the stock award, to the extent not vested or not exercised before the effective time of the transaction, in exchange for a cash payment, if any, as determined by the board; or
- make a payment, in the form determined by our board of directors, equal to the excess, if any, of (A) the value of the property the participant would have received on exercise of the award immediately before the effective time of the transaction, over (B) any exercise price payable by the participant in connection with the exercise.

The plan administrator is not obligated to treat all stock awards or portions of stock awards, even those that are of the same type, in the same manner and is not obligated to treat all participants in the same manner.

Under the 2018 Plan, a corporate transaction is generally the consummation of: (1) a sale of all or substantially all of our assets, (2) the sale or disposition of more than 50% of our outstanding securities, (3) a merger or consolidation where we do not survive the transaction, or (4) a merger or consolidation where we do survive the transaction but the shares of our common stock outstanding immediately before such transaction are converted or exchanged into other property by virtue of the transaction.

In the event of a change in control, the board of directors may take any of the above-mentioned actions. Awards granted under the 2018 Plan will not receive automatic acceleration of vesting and exercisability in the event of a change in control, although this treatment may be provided for in an award agreement or other written agreement between the Company and the participant. Under the 2018 Plan, a change in control is generally (1) the acquisition by any person or company of more than 50% of the combined voting power of our then outstanding stock, (2) a merger, consolidation or similar transaction in which our stockholders immediately before the transaction do not own, directly or indirectly, more than 50% of the combined voting power of the surviving entity (or the parent of the surviving entity), (3) a sale, lease, exclusive license or other disposition of all or substantially all of our assets other than to an entity more than 50% of the combined voting power of which is owned by our stockholders, (4) a complete dissolution or liquidation of the Company, or (5) when a majority of our board of directors becomes comprised of individuals who were not serving on our board of directors on the date of the underwriting agreement related to this offering, or the incumbent board, or whose nomination, appointment, or election was not approved by a majority of the incumbent board still in office.

Transferability. Under the 2018 Plan, stock awards are generally not transferable other than by will or the laws of descent and distribution, or as otherwise permitted by our board of directors.

Plan Amendment or Termination. Our board of directors has the authority to amend, suspend, or terminate our 2018 Plan, provided that such action does not materially impair the existing rights of any participant without such participant's written consent. Certain material amendments also require the approval of our stockholders. No incentive stock options may be granted after the tenth anniversary of the date our board of directors adopted our 2018 Plan. No stock awards may be granted under our 2018 Plan while it is suspended or after it is terminated.

Amended and Restated 2006 Equity Compensation Plan

Our board of directors adopted and our stockholders originally approved our 2006 Plan in September 2006, and it was subsequently amended and restated in September 2008 and most recently amended in March 2016. All references herein to our 2006 Plan shall be deemed to refer to our Amended and Restated 2006 Equity Compensation Plan, as amended, unless the context otherwise requires. Our 2006 Plan allows for the grant of ISOs to employees, including employees of any subsidiary, and for the grant of NSOs, stock appreciation rights, restricted stock awards and restricted stock units and other equity awards to employees, directors and consultants, including employees and consultants of our subsidiaries. As of June 30, 2018, there remained 83,505 shares of common stock available for the grant of awards under the 2006 Plan, and there were options to purchase 416,937 shares of common stock outstanding under the 2006 Plan.

Once our 2018 Plan becomes effective, no further grants will be made under our 2006 Plan. Any outstanding awards granted under our 2006 Plan will remain subject to the terms of our 2006 Plan and applicable award agreements.

Authorized Shares. The maximum number of shares of our common stock that may be issued under our 2006 Plan is 511,194 shares. Shares subject to stock awards granted under our 2006 Plan that expire, are forfeited, or terminate without being exercised in full do not reduce the number of shares available for issuance under our 2006 Plan.

Plan Administration. Our board of directors or a duly authorized committee of our board of directors administers our 2006 Plan. Our board of directors shall have the sole authority to (i) determine the individuals to whom grants shall be made under the 2006 Plan, (ii) determine the type, size and terms of the grants to be made to each such individual, (iii) determine the time when the grants will be made and the duration of any applicable exercise or restriction period, including the criteria for exercisability and the acceleration of exercisability, (iv) amend the terms of any previously issued grant, and (v) deal with any other matters arising under the 2006 Plan.

Change of Control. Our 2006 Plan provides that in the event of a change of control, all awards granted under the 2006 Plan shall become fully vested and exercisable (as applicable), unless the board of directors determines otherwise. In the event of a change of control, the administrator may take any of the following actions with respect to any or all outstanding awards: (i) determine that all outstanding options and stock appreciation rights that are not exercised shall be assumed by, or replaced with comparable options by the surviving corporation (or a parent or subsidiary of the surviving corporation), and other outstanding grants that remain in effect after the change of control shall be converted to similar grants of the surviving corporation (or a parent or subsidiary of the surviving corporation), (ii) require that grantees surrender their outstanding options and stock appreciation rights in exchange for one or more payments, in cash or Company stock as determined by the board of directors, in an amount, if any, equal to the amount by which the then fair market value of the shares of Company stock subject to the grantee's unexercised options and stock appreciation rights exceeds the exercise price or base amount of the options and stock appreciation rights, on such terms as the board of directors determines, or (iii) after giving grantees an opportunity to exercise their outstanding options and stock appreciation rights, terminate any or all unexercised options and stock appreciation rights at such time as the board of directors deems appropriate. Such assumption, surrender or termination shall take place as of the date of the change of control or such other date as the board of directors may specify.

Under the 2006 Plan, a change of control is generally (1) the acquisition by any person or company of more than 50% of the combined voting power of our then outstanding stock, (2) the consummation of a merger or consolidation with another corporation where our stockholders, immediately prior to the merger or consolidation, will not beneficially own, immediately after the merger or consolidation, shares entitling such stockholders to more than 50% of all votes to which all stockholders of the surviving corporation would be entitled in the election of directors, (3) the consummation of a sale or other disposition of all or substantially all of our assets, or (4) the consummation of a liquidation or dissolution.

Transferability. Under our 2006 Plan, awards are generally not transferable other than by will or the laws of descent and distribution or as otherwise permitted by the Board.

Plan Amendment or Termination. Our board of directors has the authority to amend, suspend, or terminate our 2006 Plan, although certain material amendments require the approval of our stockholders, and amendments that would materially impair the rights of any participant require the consent of that participant.

2018 Employee Stock Purchase Plan

Our board of directors adopted, and our stockholders approved, our 2018 ESPP in July 2018. 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 for U.S. employees.

Share Reserve. Following this offering, the ESPP authorizes the issuance of 175,000 shares of our common stock under 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, beginning on January 1, 2019 (assuming the ESPP becomes effective in 2018) through January 1, 2028, by the lesser of (1) 1% of the total number of shares of our common stock outstanding on the last day of the calendar month before the date of the automatic increase, and (2) 220,000 shares; provided that before 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). As of the date hereof, no shares of our common stock have been purchased under the ESPP.

Administration. Our board of directors administers the ESPP and may delegate its 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 that is at least the lesser of (1) 85% of the fair market value of a share of our common stock on the first date of an offering, or (2) 85% of the fair market value of a share of our common stock on the date of purchase. For the initial offering, which we expect will commence on the execution and delivery of the underwriting agreement relating to this offering, the fair market value on the first day of the offering period will be the price at which shares of common stock are first sold to the public.

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 calendar 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 under 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 class(es) and maximum number of shares reserved under the ESPP, (2) the class(es) and maximum number of shares by which the share reserve may increase automatically each year, (3) the class(es) and number of shares subject to and purchase price applicable to outstanding offerings and purchase rights, and (4) the class(es) and number of shares that are subject to purchase limits under ongoing offerings.

Corporate Transactions. In the event of certain significant corporate transactions, 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 before such corporate transaction, and such purchase rights will terminate immediately.

Under the ESPP, a corporate transaction is generally the consummation of: (1) a sale of all or substantially all of our assets, (2) the sale or disposition of more than 50% of our outstanding securities, (3) a merger or consolidation where we do not survive the transaction, and (4) a merger or consolidation where we do survive the transaction but the shares of our common stock outstanding immediately before such transaction are converted or exchanged into other property by virtue of the transaction,

ESPP Amendment or 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.

Limitations on Liability and Indemnification

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 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 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 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, executive officers and other employees as determined by the board of directors. 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 any action or proceeding.

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 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.

Rule 10b5-1 Sales Plans

Our directors and officers may adopt written plans, known as Rule 10b5-1 plans, in which they will contract with a broker to buy or sell shares of our common stock on a periodic basis. Under a Rule 10b5-1 plan, a broker executes trades under parameters established by the director or officer when entering into the plan, without further direction from them. The director or officer may amend a Rule 10b5-1 plan in some circumstances and may terminate a plan at any time. Our directors and executive officers may also buy or sell additional shares outside of a Rule 10b5-1 plan when they do not possess of material nonpublic information, subject to compliance with the terms of our insider trading policy. During the first 180 days following this offering, the sale of any shares under such plan would be subject to the lock-up agreement that the director or officer has entered into with the underwriters.

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, 2015 to which we were a party or will be a party, in which:

- the amounts involved exceeded or will exceed $120,000; and
- any of our directors, executive officers or holders of more than 5% of our capital stock, or any member of the immediate family of, or person sharing the household with, the foregoing persons, had or will have a direct or indirect material interest.

Participation in this Offering

Certain of our existing beneficial owners of more than 5% of our voting securities, including entities affiliated with them or with certain of our directors, have indicated an interest in purchasing an aggregate of approximately $8.0 million in units in this offering at the initial public offering price per unit. Based on an assumed initial public offering price of $6.50 per unit, these persons and entities would purchase an aggregate of approximately 1,230,770 of the 2,450,000 units in this offering based on these indications of interest. However, because indications of interest are not binding agreements or commitments to purchase, the underwriters may determine to sell more, less or no units in this offering to any of these persons or entities, or any of these persons or entities may determine to purchase more, less or no units in this offering.

Convertible Promissory Note Financing

In February 2016, we issued convertible promissory notes in the aggregate principal amount of $1.5 million with an interest rate of 8% per annum. These convertible promissory notes provided for conversion into preferred shares in our next equity financing, at a rate equal to the principal amount of the convertible promissory notes and accrued interest thereon divided by the per share purchase price of the preferred shares in that financing. As further discussed below, on March 4, 2016, these convertible promissory notes converted into an aggregate of 3,138,013 shares of our Series D convertible preferred stock.

The participants in this note financing included the following members of our board of directors and holders of more than 5% of our outstanding capital stock:

Name of Participant	Total Principal Amount
Entities affiliated with LC Fund VI, L.P.(1)	$ 750,000
Entities affiliated with Domain Partners VIII, L.P.(2)	$ 750,000

(1) Includes (i) $715,042 in cash from LC Fund VI, L.P. and (ii) $34,958 in cash from LC Healthcare Fund I, L.P.
(2) Includes (i) $744,476 in cash from Domain Partners VIII, L.P., and (ii) $5,524 in cash from DP VIII Associates, L.P.

Series D Convertible Preferred Stock and Warrant Financing

In March and April 2016, we issued and sold, in a series of closings, an aggregate of 20,652,486 shares of our Series D convertible preferred stock at a purchase price of $0.48 per share for an aggregate purchase price of approximately $9.9 million, and warrants to purchase an aggregate of 31,672,817 shares of our Series D convertible preferred stock for an aggregate purchase price of approximately $31,673. In connection with the first closing of this financing in March 2016, an aggregate of approximately $1.5 million in principal and accrued interest outstanding under the subordinated convertible promissory notes we issued in February 2016 converted into an aggregate of 3,138,013 shares of our Series D convertible preferred stock.

All purchasers of our Series D convertible preferred stock are entitled to specified registration rights. See the section titled “Description of Securities—Registration Rights” for more information regarding these

registration rights. The following table summarizes the Series D convertible preferred stock purchased by affiliates of our executive officers and of members of our board of directors and holders of more than 5% of our outstanding capital stock:

Name of Participant	Shares of Series D Convertible Preferred Stock	Warrants to Purchase Shares of Series D Convertible Preferred Stock	Aggregate Purchase Price
Entities affiliated with LC Fund VI, L.P. (1)	6,443,565	11,263,624	$3,104,175
Entities affiliated with Domain Partners VIII, L.P.(2)	6,443,565	7,412,740	$3,100,324
Han Cao	4,362,062	10,731,083	$2,104,521
Novartis Bioventures Ltd.	1,615,096	—	$ 775,246

(1) Includes: (i) $716,609 of unpaid principal and accrued interest and $2,242,877 in cash from LC Fund VI, L.P., and (ii) $35,035 of unpaid principal and accrued interest and $109,654 in cash from LC Parallel Fund VI, L.P.

(2) Includes: (i) $749,045 of unpaid principal and accrued interest and $2,328,444 in cash from Domain Partners VIII, L.P., and (ii) $5,558 of unpaid principal and accrued interest and $17,277 in cash from DP VIII Associates, L.P.

Series D-1 Convertible Preferred Stock Financing

In August 2016, as well as January, February, March, April, May, July, August and November 2017, we issued and sold, in a series of closings, an aggregate of 66,141,257 shares of our Series D-1 convertible preferred stock at a purchase price of $0.48 per share for an aggregate gross proceeds of approximately $31.7 million. All purchasers of our Series D-1 convertible preferred stock are entitled to certain registration rights. See the section titled “Description of Securities—Registration Rights” for more information regarding these registration rights. The following table summarizes the Series D-1 convertible preferred stock purchased by affiliates of our executive officers and of members of our board of directors and holders of more than 5% of our outstanding capital stock:

Name of Participant	Shares of Series D-1 Convertible Preferred Stock	Aggregate Purchase Price
Entities affiliated with LC Fund VI, L.P.(1)	27,305,708	$13,106,740
Praise Alliance International Limited	12,500,000	$ 6,000,000
Full Succeed International Limited	10,416,667	$ 5,000,000
Entities affiliated with Domain Partners VIII, L.P.(2)	3,710,247	$ 1,780,918
Novartis Bioventures Ltd.	1,070,373	$ 513,779
Han Cao	104,167	$ 50,000

(1) Includes (i) $1,883,867 in cash from LC Fund VI, L.P.; (ii) $11,106,738 in cash from LC Healthcare Fund I, L.P.; and (iii) $116,135 in cash from LC Parallel Fund VI, L.P.

(2) Includes (i) $1,767,801 in cash from Domain Partners VIII, L.P., and (ii) $13,117 in cash from DP VIII Associates, L.P.

Convertible Promissory Note Financing

In February 2018, we issued convertible promissory notes in the aggregate principal amount of approximately $13.4 million with an interest rate of 8% per annum. These convertible promissory notes provide for conversion under the following three circumstances:

Conversion at Qualifying financing – Upon the closing of an equity financing involving the sale by us of convertible preferred stock in which we receive an aggregate of at least $15,000,000 in cumulative gross proceeds, the conversion price will equal 75% of the lowest per share cash purchase price of the convertible

preferred stock sold by us in such qualified financing. The original principal amount and accrued interest under each convertible promissory note shall automatically convert into convertible preferred stock.

Conversion at Initial Public Offering – Prior to the maturity date of the convertible promissory notes, if we complete our initial public offering, the convertible promissory notes will automatically convert into shares of our common stock at an amount equal to the original principal amount and accrued interest under each convertible promissory note divided by 75% of either the per share cash purchase price of the common stock offered to the public in the initial public offering or the per unit cash purchase price of the units offered to the public in the initial public offering, as applicable.

Optional Conversion at Maturity – Upon maturity, and at the election of the holder, the convertible promissory notes will convert into shares of Series D-2 convertible preferred stock as is equal to the original principal amount and accrued interest under each convertible promissory note divided by the price per share. The price per share is defined as $60,000,000 divided by the aggregate number of outstanding shares of our common stock as of the maturity date.

Accordingly, in connection with the completion of our initial public offering, the principal amount of the convertible promissory notes and accrued interest thereon will automatically convert into 3,018,312 shares of our common stock, assuming an initial public offering price of $6.50 per unit and a conversion date of June 30, 2018.

The participants in this note financing included the following members of our board of directors and holders of more than 5% of our outstanding capital stock:

Name of Participant	Total Principal Amount
Entities affiliated with LC Fund VI, L.P. (1)	$ 8,460,000
Entities affiliated with Domain Partners VIII, L.P.(2)	$ 1,500,000

(1) Includes (i) $3,460,000 in cash from LC Healthcare Fund I, L.P.; and (ii) $5,000,000 cash from Rosy Shine Limited.
(2) Includes (i) $1,488,952 in cash from Domain Partners VIII, L.P., and (ii) $11,048 in cash from DP VIII Associates, L.P.

One of our directors, Junfeng Wang, is affiliated with LC Fund VI, L.P. (and its affiliated entities that participated in the financings described above).

Investors' Rights Agreement

In August 2016, we entered into a fifth amended and restated investors' rights agreement, or the IRA, with certain holders of our preferred stock and common stock, including entities affiliated with LC Fund VI, L.P. and Domain Partners VIII, L.P. and including certain members of, and affiliates of, our directors and certain of our executive officers. The IRA provides the holders of our 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 Company has obtained a waiver of these rights in connection with the S-1. 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 shall terminate immediately prior to, but subject to, the consummation of this firm-commitment underwritten public offering pursuant to the registration statement of which this prospectus forms a part. After 12 months following the closing of this offering, the holders of 4,948,360 shares of our common stock issuable upon conversion of outstanding preferred stock will be entitled to rights with respect to the registration of their shares of common stock under the Securities Act under this agreement. For a description of these registration rights, see "Description of Securities—Registration Rights."

Indemnification Agreements

Our amended and restated certificate of incorporation will contain provisions limiting the liability of directors, and our amended and restated bylaws 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 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 "Executive Compensation—Limitations on Liability and Indemnification Matters."

Policies and Procedures for Transactions with Related Persons

Prior to completion of this offering, we intend to adopt a written policy that our executive officers, directors, nominees for election as a director, beneficial owners of more than 5% of any class of our common stock and any members of the immediate family of any of the foregoing persons are not permitted to enter into a related person transaction with us without the approval or ratification of our board of directors or our audit committee. Any request for us to enter into a transaction with an executive officer, director, nominee for election as a director, beneficial owner of more than 5% of any class of our common stock, or any member of the immediate family of any of the foregoing persons, in which the amount involved exceeds $120,000 and such person would have a direct or indirect interest, must be presented to our board of directors or our audit committee for review, consideration and approval. In approving or rejecting any such proposal, our board of directors or our audit committee is to consider the material facts of the transaction, including whether the transaction is on terms no less favorable than terms generally available to an unaffiliated third party under the same or similar circumstances and the extent of the related person's interest in the transaction.

PRINCIPAL STOCKHOLDERS

The following table sets forth information regarding beneficial ownership of our capital stock by:

- each person, or group of affiliated persons, known by us to beneficially own more than 5% of our common stock;
- each of our directors;
- each our of named executive officers; and
- all of our current executive officers and directors as a group.

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.

The percentage ownership information under the column entitled “Before Offering” is based on 78,045 shares of our common stock outstanding as of June 30, 2018, assuming the conversion of all outstanding shares of our convertible preferred stock into 2,850,280 shares of common stock.

The percentage ownership information under the column entitled “After Offering” is based on the sale of 2,450,000 units in this offering, assuming (i) no exercise of the underwriters’ option to purchase additional shares, and (ii) the conversion of approximately $14.4 million aggregate principal amount of outstanding convertible promissory notes plus accrued interest thereon into 3,018,312 shares of common stock (based on an assumed initial public offering price of $6.50 per unit (the midpoint of the price range set forth on the cover page of this prospectus) and a conversion date of June 30, 2018). The table does not include the shares of common stock issuable upon the exercise of the warrants included in the units to be sold in the offering.

Information with respect to beneficial ownership has been furnished by each director, officer or beneficial owner of more than 5% of our common stock. We have determined beneficial ownership in accordance with the rules of the SEC. These rules generally attribute beneficial ownership of securities to persons who possess sole or shared voting power or investment power with respect to those securities. In addition, the rules include shares of our common stock issuable pursuant to the exercise of stock options or warrants that are either immediately exercisable or exercisable within 60 days after June 30, 2018. These shares are deemed to be outstanding and beneficially owned by the person holding those options or warrants for the purpose of computing the percentage ownership of that person, but they are not treated as outstanding for the purpose of computing the percentage ownership of any other person. Unless otherwise indicated, the persons or entities identified in this table have sole voting and investment power with respect to all shares shown as beneficially owned by them, subject to applicable community property laws.

Certain of our existing stockholders, including entities affiliated with them or with certain of our directors, have indicated an interest in purchasing an aggregate of approximately $8.0 million in units in this offering at the initial public offering price per unit. Based on an assumed initial public offering price of $6.50 per unit, these persons and entities would purchase an aggregate of approximately 1,230,770 of the 2,450,000 units in this offering based on these indications of interest. However, because indications of interest are not binding agreements or commitments to purchase, the underwriters may determine to sell more, less or no units in this offering to any of these persons or entities, or any of these persons or entities may determine to purchase more, less or no units in this offering. The following table does not reflect any potential purchases by these persons or entities or their affiliated entities, nor does it give effect to any units that may be acquired by our stockholders, directors or executive officers pursuant to the reserved share program.

Unless otherwise indicated, the address for each beneficial owner listed in the table below is c/o Bionano Genomics, Inc., 9640 Towne Centre Drive, Suite 100, San Diego, California 92121.

Name of Beneficial Owner	Number of Shares Beneficially Owned Before the Offering	Number of Shares Beneficially Owned After the Offering	Percentage of Shares Beneficially Owned	
			Before Offering	After Offering
Greater than 5% Stockholders				
Entities affiliated with LC Fund VI, L.P.(1)	1,251,355	2,776,060	39.2%	33.1%
Entities affiliated with Domain Partners VIII, L.P.(2)	806,884	912,708	25.7%	10.9%
ETP Global Fund, LP(3)	—	633,997	*	7.6%
Directors and Named Executive Officers				
David L. Barker, Ph.D.(4)	8,536	8,536	*	*
Darren Cai, Ph.D.	—	—	*	*
Han Cao, Ph.D.(5)	402,015	151,289	12.5%	1.8%
R. Erik Holmlin, Ph.D.(6)	107,041	107,041	3.5%	1.3%
Albert Luderer, Ph.D.(7)	5,861	5,861	*	*
Christopher Twomey	—	—	*	*
Junfeng Wang(1)	1,252,736	2,777,441	39.2%	33.1%
Mike Ward(8)	22,887	22,887	*	*
Quan Zhou(1)	1,252,736	2,777,441	39.2%	33.1%
All directors and executive officers as a group (11 persons)(9)	1,840,936	3,114,915	50.2%	36.1%

* Represents beneficial ownership of less than 1%.

(1) Consists of (i) 426,900 shares of common stock and 250,902 shares of common stock issuable upon the exercise of warrants held by LC Fund VI, L.P., (ii) 20,656 shares of common stock and 12,266 shares of common stock issuable upon the exercise of warrants held by LC Parallel Fund VI, L.P. and (iii) 540,631 shares of common stock held by LC Healthcare Fund I, L.P. The number of shares beneficially owned after the offering includes an aggregate of 1,787,873 shares of our common stock issuable upon the automatic conversion of (a) $3,460,000 of outstanding principal, plus accrued interest thereon, underlying a convertible promissory note held by LC Healthcare Fund I, L.P. and (b) $5,000,000 of outstanding principal, plus accrued interest thereon, underlying a convertible promissory note held by Rosy Shine Limited, upon the completion of this offering at an assumed initial public offering price of $6.50 per unit (the midpoint of the range set forth on the cover page of this prospectus), assuming a conversion date of June 30, 2018. Each of LC Fund VI, L.P., LC Parallel Fund VI, L.P., and LC Healthcare Fund I, L.P., collectively referred to as the LC Funds, are ultimately controlled and managed by Legend Capital, a limited liability Chinese company. Legend Capital is ultimately controlled by a management team consisting of three key individuals, Linan Zhu, Hao Chen, and Nengguang Wang. In addition, Junfeng Wang is a Managing Director of Legend Capital. Each of these individual managers of Legend Capital shares voting and investment power over the shares held by the LC Funds and each disclaims beneficial ownership of all shares held by Legend Capital, except to the extent of each such member's actual pecuniary interest therein. Rosy Shine Limited is ultimately controlled and managed by Legend Holdings, a limited liability Chinese joint stock company listed on a Stock Exchange of Hong Kong (3396), which is controlled by its board of directors. The board of directors of Legend Holdings has sole voting and investment power over the shares held by Rosy Shine Limited. None of the members of the board of directors has individual voting or investment power with respect to such shares and each disclaims beneficial ownership of such shares. The address of the each of the above entities is Legend Capital, 10F, Tower A, Raycom Infotech Park, No.2, Kexueyuan South Road, Zhongguancun, Haidian District, Beijing 100190 PRC.

(2) Consists of (i) 591,184 shares of common stock and 209,620 shares of common stock issuable upon the exercise of warrants held by Domain Partners VIII, L.P., (ii) 4,386 shares of common stock and 1,554 shares of common stock issuable upon the exercise of the warrants held by DP VIII Associates, L.P. and (iii) 140 shares of common stock held by Domain Associates, L.L.C. The number of shares beneficially owned after the offering includes an aggregate of 316,998 shares of our common stock issuable upon the automatic conversion of $1,500,000 of outstanding principal plus accrued interest underlying convertible notes held by Domain Partners VIII, L.P. and DP VIII Associates, L.P., upon the completion of this offering at an assumed initial public offering price of $6.50 per unit (the midpoint of the range set forth on the cover page of this prospectus), and assuming the occurrence of the conversion on June 30, 2018. James C. Blair, Brian H. Dovey, Brian K. Halak, Jesse I. Treu and Nicole Vitullo, the managing members of One Palmer Square VIII, L.L.C., share voting and investment power over the shares held by Domain Partners VIII, L.P. and DP VIII Associates, L.P. James C. Blair, Brian H. Dovey, Brian K. Halak, Nicole Vitullo, and Kim P. Kamdar, the managing members of Domain Associates, L.L.C., share voting and investment power over the shares held by Domain Associates, L.L.C. Each managing member of One Palmer Square VIII, L.L.C. and Domain Associates, L.L.C. disclaims beneficial ownership of all shares held by the Domain Entities, except to the extent of each such managing member's actual pecuniary interest therein. The address for the Domain Entities is One Palmer Square, Suite 515, Princeton, NJ 08542.

(3) The number of shares beneficially owned after the offering includes an aggregate of 633,997 shares of our common stock issuable upon the automatic conversion of $3,000,000 of outstanding principal plus accrued interest underlying convertible notes held by ETP Global Fund, LP. ETP Global Fund, LP, or ETP Global, is a limited partnership organized under the laws of the State of Delaware. Emerging Technology Partners LLC is the general partner of ETP Global, and Wei-Wu He is its managing member, who exercises sole voting and investment power over the shares held by ETP Global. Wei-Wu He disclaims beneficial ownership of the shares held by ETP Global, except to the extent of his pecuniary interest therein. The registered address of ETP Global and Emerging Technology Partners LLC is 4919 Rebel Ridge Dr., Sugarland, TX 77478.

(4) Consists of 8,536 shares of common stock subject to options exercisable as of August 29, 2018.

(5) Consists of 112,936 shares of common stock, 250,726 shares of common stock issuable upon the exercise of warrants and 38,353 shares of common stock subject to options exercisable as of August 29, 2018.

(6) Consists of 107,041 shares of common stock subject to options exercisable as of August 29, 2018.

(7) Consists of 5,861 shares of common stock subject to options exercisable as of August 29, 2018.

(8) Consists of 22,887 shares of common stock subject to options exercisable as of August 29, 2018.

(9) Consists of the shares identified in footnotes (1), (4), (5), (6), (7) and (8), and 41,860 shares of common stock subject to options exercisable as of August 29, 2018.

DESCRIPTION OF SECURITIES

General

Upon filing of our amended and restated certificate of incorporation and the completion of this offering, our authorized capital stock will consist of 200,000,000 shares of common stock, par value $0.0001 per share, and 10,000,000 shares of preferred stock, par value $0.0001 per share. All of our authorized preferred stock upon the completion of this offering will be undesignated. The following is a summary of the rights of our common and preferred stockholders and some of the provisions of our amended and restated certificate of incorporation and amended and restated bylaws, which will become effective immediately prior to and upon the completion of this offering, respectively, and of the Delaware General Corporation Law. This summary is not complete. For more detailed information, please see our amended and restated certificate of incorporation and amended and restated bylaws, which are filed as exhibits to the registration statement of which this prospectus is a part, as well as the relevant provisions of the Delaware General Corporation Law.

Units

Each unit offered consists of one share of our common stock and one warrant to purchase one share of our common stock. We anticipate that the units will begin trading on or promptly after the date of this prospectus. The units will automatically separate 30 days after the date of this prospectus, and the shares of common stock and the warrants underlying the units will begin trading separately, unless Roth Capital Partners, LLC, as the representative of the underwriters, determines that an earlier date is acceptable (based upon, among other things, its assessment of the relative strengths of the securities markets and small capitalization companies in general, and the trading pattern of, and demand for, our securities in particular). If Roth Capital Partners, LLC permits separate trading of our common stock and warrants prior to September , 2018, we will issue a press release and file a Current Report on Form 8-K with the SEC announcing when such separate trading will begin.

Common Stock

Outstanding Shares

As of June 30, 2018, there were 78,045 shares of common stock issued and outstanding held of record by 86 stockholders. This amount excludes our outstanding shares of convertible preferred stock, which will convert into 2,850,280 shares of common stock in connection with the closing of this offering. Based on the number of shares of common stock outstanding as of June 30, 2018, and assuming (i) the automatic conversion of all of our outstanding shares of convertible preferred stock into an aggregate of 2,850,280 shares of common stock, (ii) the conversion of approximately $14.4 million aggregate principal amount of outstanding convertible promissory notes plus accrued interest thereon into 3,018,312 shares of common stock (based on an assumed initial public offering price of $6.50 per unit (the midpoint of the price range set forth on the cover page of this prospectus) and a conversion date of June 30, 2018), and (iv) the issuance by us of 2,450,000 units in this offering, there will be 8,396,637 shares of common stock outstanding upon the completion of this offering (including shares of common stock included in the units but excluding shares underlying the warrants included in the units).

Voting Rights

Our common stock is entitled to one vote for each share held of record on all matters submitted to a vote of the stockholders, including the election of directors, and does not have cumulative voting rights. Our amended and restated certificate of incorporation establishes a classified board of directors that is divided into three classes with staggered three-year terms. Only the directors in one class will be subject to election by a plurality of the votes cast at each annual meeting of our stockholders, with the directors in the other classes continuing for the remainder of their respective three-year terms.

Economic Rights

Except as otherwise expressly provided in our eighth amended and restated certificate of incorporation or required by applicable law, all shares of common stock will have the same rights and privileges and rank equally, share ratably, and be identical in all respects for all matters, including those described below.

Dividends. Subject to preferences that may be applicable to any then-outstanding preferred stock, the holders of common stock are entitled to receive dividends, if any, as may be declared from time to time by our board of directors out of legally available funds.

Liquidation Rights. In the event of our liquidation, dissolution or winding-up, holders of our common stock will be entitled to share ratably in the net assets legally available for distribution to stockholders after the payment of all of our debts and other liabilities, subject to the satisfaction of any liquidation preference granted to the holders of any outstanding shares of preferred stock.

No Preemptive or Similar Rights

The holders of our shares of common stock are not entitled to preemptive rights, and are not subject to conversion, redemption or sinking fund provisions. The rights, preferences and privileges of the holders of our common stock are subject to, and may be adversely affected by, the rights of the holders of shares of any series of our preferred stock that we may designate and issue in the future.

Fully Paid and Non-Assessable

All of our outstanding shares of common stock are, and the shares of common stock forming part of the units to be issued in this offering will be, fully paid and nonassessable.

Convertible Preferred Stock

As of June 30, 2018, there were 121,992,497 shares of our convertible preferred stock outstanding, held of record by 22 holders. Immediately prior to the closing of this offering, each 42.8 outstanding shares of our preferred stock will convert into one share of our common stock. In addition, immediately prior to the completion of this offering, our certificate of incorporation will be amended and restated to delete all references to such shares of convertible preferred stock. Under this amended and restated certificate of incorporation, our board of directors will have the authority, without further action by our stockholders, to issue up to 10,000,000 shares of convertible preferred stock in one or more series, to establish from time to time the number of shares to be included in each such series, to fix the rights, preferences and privileges of the shares of each wholly unissued series and any qualifications, limitations or restrictions thereon and to increase or decrease the number of shares of any such series, but not below the number of shares of such series then outstanding.

Our board of directors may authorize the issuance of preferred stock with voting or conversion rights that could adversely affect the voting power or other rights of the holders of the common stock. The issuance of preferred stock, while providing flexibility in connection with possible acquisitions and other corporate purposes, could, among other things, have the effect of delaying, deferring or preventing a change in our control that may otherwise benefit holders of our common stock and may adversely affect the market price of the common stock and the voting and other rights of the holders of common stock. We have no current plans to issue any shares of preferred stock.

Warrants Issued as Part of the Units

Each warrant underlying a unit entitles the holder to purchase one share of our common stock at an initial exercise price of $, or 100% of the initial public offering price per unit, subject to adjustment. Each

warrant will be exercisable 30 days after the date of this prospectus, or the date on which Roth Capital Partners, LLC, as the representative of the underwriters, separates the units, whichever date is earlier and will expire at 5:00 p.m. New York City time on August , 2023.

The warrants will be issued in registered form, in each case pursuant to a warrant agreement between American Stock Transfer & Trust Company, LLC, as warrant agent, and us.

We have applied to list the warrants on Nasdaq under the symbol “BNGOW.”

The exercise price and number of shares issuable upon exercise of the warrants may be adjusted upon the occurrence of certain events, including but not limited to any stock split, stock dividend, extraordinary dividend, recapitalization, reorganization, merger or consolidation. However, the warrants will not be adjusted for issuances of common stock or securities convertible or exercisable into common stock at a price below the then current exercise price of such warrant.

If, at any time warrants are outstanding, we consummate any fundamental transaction, as described in such warrants and generally including any consolidation or merger with or into another corporation, the consummation of a transaction whereby another entity acquires more than 50% of our outstanding common stock, or the sale or other disposition of all or substantially all of our assets, or other transaction in which our common stock are converted into or exchanged for other securities or other consideration, the holder of any such warrants will thereafter receive upon exercise of such warrants, the securities or other consideration to which a holder of the number of common stock then deliverable upon the exercise or conversion of such warrants would have been entitled upon such consolidation or merger or other transaction.

The number of shares of our common stock that may be acquired by any holder upon any exercise of the warrants will be limited to the extent necessary to insure that, following such exercise (or other issuance), the total number of common stock then beneficially owned by such holder and its affiliates and any other persons whose beneficial ownership of common stock would be aggregated with the holder’s for purposes of Section 13(d) of the Securities Exchange Act of 1934, as amended, does not exceed 9.99% (or in certain instances 4.99%) of the total number of issued and outstanding shares of our common stock (including for such purpose the common stock issuable upon such exercise), which we refer to as the beneficial ownership limitation; provided, however, that if a holder and/or its affiliates already own 9.99% (or 4.99%, as applicable) on the date of this offering then the beneficial ownership limitation will not apply to such holder. A holder may elect to increase or decrease this beneficial ownership limitation from 9.99% (or 4.99%, as applicable) to any other percentage of the total number of issued and outstanding shares of our common stock (including for such purpose the common stock issuable upon such exercise) upon providing us with not less than 61 days’ prior written notice, and any such increase will apply only to such holder.

The warrants may be exercised, at the option of each holder, in whole or in part, upon surrender of the warrant certificate on or prior to the expiration date at the offices of the warrant agent, with the exercise form on the reverse side of the warrant certificate completed and executed as indicated, accompanied by full payment of the exercise price for the number of common stock purchased upon such exercise, by certified check payable to us or by wire transfer of immediately available funds to an account designated by us. Subject to applicable laws, the warrants may be transferred at the option of the holders upon surrender of the warrants to us together with the appropriate instruments of transfer.

The warrant holders will not have the rights or privileges of holders of common stock and any voting rights until they exercise their warrants and receive common stock. After the issuance of common stock upon exercise of such warrants, each holder will be entitled to one vote for each common stock held of record on all matters to be voted on by stockholders. If we fail to issue a holder of our warrants, within three business days after receipt of an applicable exercise notice, a certificate for the number of shares of our common stock to which such holder is entitled, then such holder can rescind the exercise of such warrant. If we are otherwise unable to issue and deliver the number of shares of our common stock that a holder is entitled to under the warrant, we have no obligation to pay such holder any cash or other consideration to settle such warrant.

Under the terms of the warrant agreement, we have agreed to use our reasonable best efforts to maintain the effectiveness of the registration statement and current prospectus relating to common stock issuable upon exercise of the warrants at any time that the warrants are exercisable. During any period that we fail to have maintained an effective registration statement covering the common stock underlying such warrants, the holder may exercise such warrants on a cashless basis.

Stock Options

As of June 30, 2018, 416,937 shares of common stock were issuable upon the exercise of outstanding stock options, at a weighted-average exercise price of $5.05 per share.

Warrants

As of June 30, 2018, the following shares of our convertible preferred stock were issuable upon the exercise of outstanding warrants:

- A warrant to purchase 42,872 shares of Series B convertible preferred stock for an exercise price of $1.3995 per share, which we issued to Square 1 Bank.
- Warrants to purchase an aggregate of 75,027 shares of Series B-1 convertible preferred stock for an exercise price of $1.3995 per share, which we issued to Square 1 Bank.
- Warrants to purchase an aggregate of 4,010,757 shares of Series B-1 convertible preferred stock for an exercise price of $1.3995 per share, which we issued to investors in connection with a series of financing transactions.
- A warrant to purchase 510,417 shares of Series D convertible preferred stock for an exercise price of $0.48 per share, which we issued to Western Alliance Bank.
- Warrants to purchase an aggregate of 31,672,817 shares of Series D convertible preferred stock for an exercise price of $0.41 per share, which we issued to investors in connection with a financing transaction.
- A warrant to purchase 291,667 shares of Series D-1 convertible preferred stock for an exercise price of $0.48 per share, which we issued to Western Alliance Bank.
- A warrant to purchase 625,000 shares of Series D-1 convertible preferred stock for an exercise price of $0.48 per share, which we issued to Midcap Financial Trust.

Each of the foregoing warrants provide for the adjustment of the number of shares issuable upon the exercise thereof in the event of stock splits, recapitalizations, reclassifications and consolidations. In addition, the warrants to purchase shares of Series B-1 convertible preferred stock and Series D convertible preferred stock that we issued in connection with our financing transactions contain provisions that provide for the automatic net exercise of such warrants upon the closing of this offering.

Registration Rights

We are party to a fifth amended and restated investors' rights agreement, dated August 5, 2016, pursuant to which certain holders of our capital stock, or their transferees, are entitled to 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 are obligated to pay the registration expenses, other than underwriting discounts and selling commissions, of the shares registered by the demand, piggyback and Form S-3 registrations 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 on the fifth anniversary of the date of a qualified public offering, a deemed liquidation event, or with respect to any particular holder of registrable securities, such time after this offering that the holder can sell all of its registrable securities without restriction under Rule 144 of the Securities Act during any three month period.

Demand Registration Rights

Any time after the earlier of (i) 12 months following the effective date of a qualified public offering and (ii) August 5, 2020, the holders of at least 66-2/3% of the shares of our outstanding preferred stock (or shares of our common stock issued upon conversion of the shares of such preferred stock, or a combination thereof) may request that we file a registration statement covering all or any portion of the registrable securities held by them, subject to the requirement that the registration must cover at least 20% of the registrable securities then held by them, or a lesser percentage if the anticipated gross receipts from the offering would exceed $40,000,000. The holders of our convertible preferred stock may not request more than two registration statements which are declared effective. We are not obligated to effect a demand registration (i) during the period within 90 days after the effective date of a registration statement filed pursuant to a demand registration, (ii) if the registrable securities can be immediately registered on Form S-3, (iii) or during the 12 month period after the effective date of this registration statement.

In addition, the warrants to purchase our Series B and B-1 convertible preferred stock that we issued to Square 1 Bank provide for the same demand registration rights as described above.

Piggyback Registration Rights

If we register any securities for public sale, holders of registration rights have the right to include their shares in the registration statement. As a result, whenever we propose to file a registration statement under the Securities Act, other than with respect to registration statements on Forms S-4, S-8, or another form not available for registering the registrable securities for sale to the public, 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.

In addition, the warrants to purchase our Series B, B-1, D and D-1 convertible preferred stock that we issued to Square 1 Bank, Western Alliance Bank and Midcap Financial Trust provide for the same piggyback registration rights as described above.

Form S-3 Registration Rights

If we are eligible to file a registration statement on Form S-3, holders of registrable securities will have the right to demand that we file a registration statement on Form S-3 so long as the aggregate price to the public of the securities to be sold under the registration statement on Form S-3 is at least $3.0 million, subject to specified exceptions, conditions and limitations. There is no limitation on the number of Form S-3 demand registrations that may be requested.

In addition, the warrants to purchase our Series B and B-1 convertible preferred stock that we issued to Square 1 Bank provide for the same Form S-3 registration rights as described above.

Anti-Takeover Provisions

The provisions of Delaware law, our eighth amended and restated certificate of incorporation and our amended and restated bylaws, which are summarized below, may have the effect of delaying, deferring or discouraging another person from acquiring control of our company. They are also designed, in part, to encourage persons seeking to acquire control of us to negotiate first with our board of directors. We believe that

the benefits of increased protection of our potential ability to negotiate with an unfriendly or unsolicited acquirer outweigh the disadvantages of discouraging a proposal to acquire us because negotiation of these proposals could result in an improvement of their terms.

Certificate of Incorporation and Bylaws to be in Effect upon the Closing of this Offering

Because our stockholders do not have cumulative voting rights, stockholders holding a majority of the voting power of our shares of common stock will be able to elect all of our directors. Our amended and restated certificate of incorporation and amended and restated bylaws to be effective upon the closing of this offering will provide for stockholder actions at a duly called meeting of stockholders or, before the date on which all shares of common stock convert into a single class, by written consent. A special meeting of stockholders may be called by a majority of our board of directors, the chair of our board of directors, or our chief executive officer. Our amended and restated bylaws will establish an advance notice procedure for stockholder proposals to be brought before an annual meeting of our stockholders, including proposed nominations of persons for election to our board of directors.

As described above in "Management— Composition of Our Board of Directors," in accordance with our amended and restated certificate of incorporation to be filed in connection with this offering, immediately after this offering, our board of directors will be divided into three classes with staggered three-year terms.

The foregoing provisions will make it more difficult for another party to obtain control of us by replacing our board of directors. Since our board of directors has the power to retain and discharge our officers, these provisions could also make it more difficult for existing stockholders or another party to effect a change in management. In addition, the authorization of undesignated preferred stock makes it possible for our board of directors to issue preferred stock with voting or other rights or preferences that could impede the success of any attempt to change our control.

These provisions are designed to reduce our vulnerability to an unsolicited acquisition proposal and to discourage certain tactics that may be used in proxy fights. However, such provisions could have the effect of discouraging others from making tender offers for our shares and may have the effect of deterring hostile takeovers or delaying changes in our control or management. As a consequence, these provisions may also inhibit fluctuations in the market price of our stock that could result from actual or rumored takeover attempts.

Section 203 of the Delaware General Corporation Law

When we have a class of voting stock that is either listed on a national securities exchange or held of record by more than 2,000 stockholders, we will be subject to Section 203 of the Delaware General Corporation Law, which prohibits a Delaware corporation from engaging in any business combination with any interested stockholder for a period of three years after the date that such stockholder became an interested stockholder, subject to certain exceptions.

Choice of Forum

Our amended and restated certificate of incorporation provides that the Court of Chancery of the State of Delaware will be the exclusive forum for: (i) any derivative action or proceeding brought on our behalf; (ii) any action asserting a breach of fiduciary duty; (iii) any action asserting a claim against us or any of our directors or officers or other employees arising under the Delaware General Corporation Law, our amended and restated certificate of incorporation or our amended and restated bylaws; or (iv) any action asserting a claim against us that is governed by the internal affairs doctrine. Our amended and restated certificate of incorporation further provides that U.S. federal district courts will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act.

Limitations on Liability and Indemnification

See “Executive Compensation—Limitations on Liability and Indemnification.”

Exchange Listing

Our common stock has been approved for listing on The Nasdaq Stock Market LLC under the symbol “BNGO” and we have applied for the listing on The Nasdaq Stock Market LLC of the units and the warrants under the symbols “BNGOU” and “BNGOW,” respectively.

Transfer Agent and, Registrar and Warrant Agent

The transfer agent and registrar for our common stock and the warrants agent for the warrants included in the units offered hereby is American Stock Transfer & Trust Company, LLC. Its address is 6201 15th Avenue, Brooklyn, New York 11219.

SHARES ELIGIBLE FOR FUTURE SALE

Before the completion of this offering, there has been no public market for our securities. Future sales of substantial amounts of our securities, including shares issued on the exercise of outstanding warrants or options, in the public market after this offering, or the possibility of these sales or issuances occurring, could adversely affect the prevailing market price for our securities or impair our ability to raise equity capital.

Based on our shares outstanding as of June 30, 2018, upon the completion of this offering, a total of 8,396,637 shares of common stock will be outstanding (including shares of common stock included in the units but excluding shares underlying the warrants included in the units). Of these shares, all of the common stock sold in this offering by us, plus any shares sold by us on exercise of the underwriters' option to purchase additional common stock, will be freely tradable in the public market without restriction or further registration under the Securities Act, unless these shares are held by "affiliates," as that term is defined in Rule 144 under the Securities Act.

The remaining securities will be, and shares of common stock subject to stock options will be on issuance, "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 Rules 144 or 701 under the Securities Act, which are summarized below. Restricted securities may also be sold outside of the U.S. to non-U.S. persons in accordance with Rule 904 of Regulation S.

Subject to the lock-up agreements described below and the provisions of Rule 144 or Regulation S under the Securities Act, as well as our insider trading policy, these restricted securities will be available for sale in the public market after the date of this prospectus.

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 below.

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 below. Beginning 90 days after the date of this prospectus upon the expiration of such lock-up agreements, 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 common stock then outstanding, which will equal approximately 83,967 shares immediately after this offering, assuming no exercise of the underwriters' option to purchase additional units from us; or
- the average weekly trading volume of 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 below.

Form S-8 Registration Statements

We intend to file one or more registration statements on Form S-8 under the Securities Act with the SEC to register the offer and sale of shares of our common stock that are issuable under our 2006 Plan, 2018 Plan and ESPP. These registration statements will become effective immediately on filing. Shares covered by these registration statements will then be eligible for sale in the public markets, subject to vesting restrictions, any applicable lock-up agreements described below, and Rule 144 limitations applicable to affiliates.

Lock-up Arrangements

We, and all of our directors, executive officers and the holders of substantially all of our common stock and securities exercisable for or convertible into our common stock outstanding immediately on the closing of this offering, have agreed with the underwriters that, until 180 days (except for our chief executive officer, who has agreed to 18 months) after the date of the underwriting agreement related to this offering, we and they will not, without the prior written consent of Roth Capital Partners, directly or indirectly, 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 or otherwise transfer or dispose of any of our shares of common stock, or any securities convertible into or exercisable or exchangeable for shares of our common stock, or enter into any swap or any other agreement or any transaction that transfers, in whole or in part, directly or indirectly, the economic consequence of ownership of the securities, whether any such swap or transaction is to be settled by delivery of our common stock or other securities, in cash or otherwise. These agreements are described in “Underwriting.” Roth Capital Partners may, in its sole discretion, release any of the securities subject to these lock-up agreements at any time.

Registration Rights

Upon the closing of this offering, pursuant to our fifth amended and restated investors’ rights agreement, the holders of 3,801,704 shares of our common stock, or their transferees, will be entitled to certain rights with respect to the registration of the offer and sale of their shares under the Securities Act, subject to the terms of the lock-up agreements described under “—Lock-Up Agreements” above. Registration of these shares under the Securities Act would result in the shares becoming freely tradable without restriction under the Securities Act immediately on the effectiveness of the registration. Any sales of securities by these stockholders could have a material adverse effect on the trading price of our common stock. See “Description of Securities Registration Rights” for additional information.

MATERIAL U.S. FEDERAL INCOME TAX CONSEQUENCES

The following is a general discussion of the material U.S. federal income considerations relating to the purchase, ownership and disposition of our units comprised of our common stock and warrants exercisable for shares of our common stock, which we refer to collectively in this summary as our securities, purchased pursuant to this offering. This discussion is based on current provisions of the Internal Revenue Code of 1986, or the Code, existing and proposed U.S. Treasury Regulations promulgated or proposed thereunder and current administrative and judicial interpretations thereof, all as in effect as of the date of this prospectus and all of which are subject to change or to differing interpretation, possibly with retroactive effect. We have not sought and will not seek any rulings from the Internal Revenue Service, or the IRS, regarding the matters discussed below. There can be no assurance that the IRS or a court will not take a contrary position.

This discussion is limited to U.S. holders and non-U.S. holders who hold our securities as capital assets within the meaning of Section 1221 of the Code (generally, as property held for investment). This discussion does not address all aspects of U.S. federal income taxation, such as the U.S. alternative minimum income tax and the Medicare contribution tax on net investment income, nor does it address any aspect of state, local or non-U.S. taxes, or U.S. federal taxes other than income taxes, such as federal estate taxes. This discussion does not consider any specific facts or circumstances that may apply to a holder and does not address the special tax considerations that may be applicable to particular holders, such as:

- banks, insurance companies or other financial institutions;
- tax-exempt or government organizations;
- brokers or dealers in securities or currencies;
- traders in securities that elect to use a mark-to-market method of accounting for their securities holdings;
- regulated investment companies or real estate investment trusts;
- persons that have a “functional currency” other than the U.S. dollar;
- persons that own, or are deemed to own, more than five percent of our capital stock (except to the limited extent set forth herein);
- certain U.S. expatriates or former long-term residents of the United States;
- persons who hold our common stock or warrants as a position in a hedging transaction, “straddle,” “conversion transaction,” synthetic security, other integrated investment, or other risk reduction transaction;
- persons deemed to sell our common stock and warrants under the constructive sale provisions of the Code;
- pension plans or other retirement accounts;
- partnerships, or other entities or arrangements treated as partnerships for U.S. federal income tax purposes, or investors in any such entities;
- integral parts or controlled entities of foreign sovereigns;
- controlled foreign corporations, passive foreign investment companies and corporations that accumulate earnings to avoid U.S. federal income tax; and
- persons required to accelerate the recognition of any item of gross income with respect to securities as a result of such income being recognized on an applicable financial statement.

If any entity taxable as a partnership for U.S. federal income tax purposes holds our securities, the U.S. federal income tax treatment of a partner in the partnership generally will depend on the status of the partner, the activities of the partnership and certain determinations made at the partner level. A partner in a partnership or other pass-through entity that holds our securities should consult his, her or its own tax advisor regarding the applicable tax consequences.

For purposes of this discussion, the term "U.S. holder" means a beneficial owner of our securities that is, for U.S. federal income tax purposes:

- an individual who is a citizen or resident of the United States;
- a corporation (including any entity classified as a corporation for U.S. federal income tax purposes) created or organized in or under the laws of the United States or of 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 (1) a U.S. court is able to exercise primary supervision over the administration of the trust and one or more U.S. persons have authority to control all substantial decisions of the trust or (2) the trust has a valid election to be treated as a U.S. person under applicable U.S. Treasury Regulations.

A "non-U.S. holder" is a beneficial owner of our securities that is not a U.S. holder or an entity taxable as a partnership for U.S. federal income tax purposes.

Prospective investors should consult their own tax advisors regarding the U.S. federal, state, local and non-U.S. income and other tax considerations of purchasing, holding and disposing of our securities.

Tax Treatment of Units

There is no authority directly addressing the treatment, for U.S. federal income tax purposes, of securities with terms substantially the same as the units, and, therefore, such treatment is not entirely clear. We intend to treat each unit for U.S. federal income tax purposes as consisting of (1) one share of our common stock and (2) one warrant exercisable to acquire one share of our common stock. Pursuant to this treatment, each holder of a unit must allocate the purchase price paid by such holder for such unit between the underlying common stock and warrant based on their respective fair market values. In addition, pursuant to this treatment, a holder's initial tax basis for U.S. federal income tax purposes in the share of common stock and the warrant that compose each unit should equal the portion of the purchase price of the unit allocated thereto.

The foregoing treatment of the units and a holder's purchase price allocation are not binding on the IRS or the courts. Because there are no authorities that directly address instruments that are similar to the securities, no assurance can be given that the IRS or the courts will agree with the characterization described above or the discussion below. Accordingly, each prospective investor should consult its own tax advisors regarding the U.S. federal tax consequences of an investment in a unit (including alternative characterizations of a unit) and with respect to any tax consequences arising under the laws of any state, local or non-United States taxing jurisdiction.

Unless otherwise stated, the following discussions are based on the assumption that the characterization of the common stock and warrants described above is accepted for U.S. federal income tax purposes.

U.S. Holders

Exercise of Warrants

Except as discussed below with respect to a cashless exercise of a warrant, a U.S. holder generally will not recognize gain or loss on the exercise of a warrant and related receipt of shares of our common stock. A U.S. holder's initial tax basis in the shares of our common stock received upon exercise of a warrant will be equal to the sum of (a) such U.S. holder's tax basis in such warrant (i.e., the portion of the U.S. holder's purchase price for a unit that is allocated to the warrant, as described above) plus (b) the exercise price paid by such U.S. holder on the exercise of such warrant. A U.S. holder's holding period for the shares of our common stock underlying the warrants will begin on the day after the date that the warrant is exercised and will not include the period during which the U.S. holder held the warrant.

In certain circumstances, the warrants will be exercisable on a cashless basis. The U.S. federal income tax treatment of an exercise of a warrant on a cashless basis is not clear, and could differ from the consequences described above. It is possible that a cashless exercise could be a taxable event. U.S. holders should consult their own tax advisors regarding the U.S. federal income tax consequences of the cashless exercise of warrants, including with respect to whether the exercise is a taxable event, and their holding period and tax basis in the common stock received.

Certain Adjustments to the Warrants

The terms of each warrant provide for an adjustment to the number of shares of common stock for which the warrant may be exercised or to the exercise price of the warrant in certain events, and a distribution upon exercise that corresponds to distributions, if any, made on the common stock after issuance of the warrants and prior to exercise. An adjustment to the exercise price of a warrant may be treated as a constructive distribution to a U.S. holder of the warrants or shares of our common stock depending on the circumstances of such adjustment if, and to the extent that, such adjustment has the effect of increasing such U.S. holder's proportionate interest in our "earnings and profits" or assets, depending on the circumstances of such adjustment. In addition, the failure to provide for such an adjustment (or to adequately adjust) may also result in a deemed distribution to U.S. holders of the warrants or shares of our common stock. Any such constructive distribution may be taxable whether or not there is an actual distribution of cash or other property. However, adjustments to the exercise price of warrants made pursuant to a bona fide reasonable adjustment formula that has the effect of preventing dilution of the interest of the holders thereof generally should not be considered to result in a constructive distribution. Generally, such deemed distributions will be taxable in the same manner as an actual distribution as described below under "—Distributions on Common Stock," below, except that it is unclear whether such deemed distributions would be eligible for the reduced tax rate applicable to certain dividends paid to non-corporate holders or the dividend-received deduction applicable to certain dividends paid to corporate holders. Generally, a U.S. holder's tax basis in the underlying stock will be increased to the extent any such constructive distribution is treated as a dividend. Proposed U.S. Treasury Regulations address the amount of, timing of, and withholding obligations in respect to, constructive distributions made to holders of convertible securities such as the warrants. These proposed regulations are effective for constructive distributions made on or after the date of finalization, but may generally be relied upon as to certain matters for constructive distributions that occur prior to such date. You should consult your tax advisor regarding the application of such regulations and other tax considerations relating to the possibility of constructive distributions.

Expiration of the Warrants without Exercise

Upon the lapse or expiration of a warrant, a U.S. holder will recognize a loss in an amount equal to such U.S. holder's tax basis in the warrant. Any such loss generally will be a capital loss and will be long-term capital loss if the warrant is held for more than one year. Deductions for capital losses are subject to limitations.

Distributions on Common Stock

If we pay distributions of cash or property with respect to shares of our common stock (including constructive distributions as described above under the heading "Certain Adjustments to the Warrants"), those distributions generally will constitute dividends for U.S. federal income tax purposes to the extent paid from our current or accumulated earnings and profits, as determined under U.S. federal income tax principles. If a distribution exceeds our current and accumulated earnings and profits, the excess will be treated as a tax-free return of the U.S. holder's investment, up to such holder's tax basis in its shares of our common stock. Any remaining excess will be treated as capital gain, subject to the tax treatment described below under the heading "—Gain on Sale, Exchange or Other Taxable Disposition of Common Stock or Warrants." Dividends received by a corporate U.S. holder may be eligible for the dividends received deduction, and dividends received by non-corporate U.S. holders generally will be subject to tax at the current lower applicable capital gains rates, provided, in each case, that certain holding period and other applicable requirements are satisfied.

Gain on Sale, Exchange or Other Taxable Disposition of Common Stock or Warrants

Upon the sale or other taxable disposition of shares of our common stock or warrants, a U.S. holder generally will recognize capital gain or loss in an amount equal to the difference, if any between (a) the amount of cash plus the fair market value of any property received and (b) such U.S. holder's tax basis in such shares of our common stock or warrants sold or otherwise disposed of. Such gain or loss generally will be long-term capital gain or loss if, at the time of the sale or other disposition, the shares of our common stock or warrants have been held by the U.S. holder for more than one year. Preferential tax rates may apply to long-term capital gain of a U.S. holder that is an individual, estate or trust. Deductions for capital losses are subject to significant limitations.

Non-U.S. Holders

Exercise or Expiration of Warrants

In general, a non-U.S. holder will not be required to recognize income, gain or loss upon the exercise of a warrant by payment of the exercise price in cash. A non-U.S. holder's initial tax basis in the shares of our common stock received upon exercise of a warrant will be equal to the sum of (a) such non-U.S. holder's tax basis in such warrant (i.e., the portion of the non-U.S. holder's purchase price for a unit that is allocated to the warrant, as described above) plus (b) the exercise price paid by such non-U.S. holder on the exercise of such warrant. A non-U.S. holder's holding period for the shares of our common stock underlying the warrants will begin on the day after the date that the warrant is exercised and will not include the period during which the non-U.S. holder held the warrant.

As discussed above in "—U.S. Holders—Exercise of Warrants," the U.S. federal income tax treatment of an exercise of a warrant on a cashless basis is not clear. Non-U.S. holders are urged to consult their tax advisors as to the consequences of an exercise of a warrant on a cashless basis, including with respect to whether the exercise is a taxable event, and their holding period and tax basis in the common stock received.

If a warrant expires without being exercised, a non-U.S. holder that is engaged in a U.S. trade or business to which any income from the warrant would be effectively connected or who is present in the United States for a period or periods aggregating 183 days or more during the calendar year in which the expiration occurs (and certain other conditions are met) will recognize a capital loss in an amount equal to such non-U.S. holder's tax basis in the warrant.

Distributions

If we pay distributions of cash or property with respect to shares of our common stock (including constructive distributions as described above under the heading "—Certain Adjustments to the Warrants"), those distributions generally will constitute dividends for U.S. federal income tax purposes to the extent paid from our current or accumulated earnings and profits, as determined under U.S. federal income tax principles. If a distribution exceeds our current and accumulated earnings and profits, the excess will be treated as a tax-free return of the non-U.S. holder's investment, up to such holder's tax basis in its shares of our common stock. Any remaining excess will be treated as capital gain, subject to the tax treatment described below under the heading "—Gain on Sale, Exchange or Other Taxable Disposition of Common Stock or Warrants." Dividends paid to a non-U.S. holder generally will be subject to withholding of U.S. federal income tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty between the United States and such holder's country of residence. In the case of any constructive distribution, it is possible that this tax would be withheld from any amount owed to the non-U.S. holder, including, but not limited to, distributions of cash, shares of our common stock or sales proceeds subsequently paid or credited to that holder. If we are unable to determine, at the time of payment of a distribution, whether the distribution will constitute a dividend, we may nonetheless choose to withhold any U.S. federal income tax on the distribution as permitted by U.S. Treasury Regulations.

Distributions that are treated as effectively connected with a trade or business conducted by a non-U.S. holder within the United States (and if an income tax treaty applies and so requires, such distribution is attributable to a

permanent establishment or fixed base maintained by such non-U.S. holder in the United States) are generally not subject to the 30% withholding tax if the non-U.S. holder provides a properly executed IRS Form W-8ECI (which should be renewed periodically) stating that the distributions are not subject to withholding because they are effectively connected with the non-U.S. holder's conduct of a trade or business in the United States. If a non-U.S. holder is engaged in a trade or business in the United States and the distribution is effectively connected with the conduct of that trade or business, the distribution will not be subject to withholding and will generally have the consequences described above for a U.S. holder (subject to any modification provided under an applicable income tax treaty). Any U.S. effectively connected income received by a non-U.S. holder that is treated as a corporation for U.S. federal income tax purposes may also, under certain circumstances, be subject to an additional "branch profits tax" at a 30% rate (or such lower rate as may be specified by an applicable income tax treaty).

A non-U.S. holder who claims the benefit of an applicable income tax treaty between the United States and such holder's country of residence generally will be required to provide a properly executed IRS Form W-8BEN or W-8BEN-E, as applicable (which should be renewed periodically), and satisfy applicable certification and other requirements. A non-U.S. holder that is eligible for a reduced rate of U.S. withholding tax under an income tax treaty generally may obtain a refund or credit of any excess amounts withheld by timely filing an appropriate claim with the IRS. Non-U.S. holders should consult their own tax advisors regarding their entitlement to benefits under a relevant income tax treaty.

Distributions on shares of our common stock paid to a non-U.S. holder may also be subject to the withholding described under "—The Foreign Account Tax Compliance Act" below.

Gain on Sale, Exchange or Other Taxable Disposition of common stock or warrants

Subject to the discussion below in "—Information Reporting and Backup Withholding" and "—Foreign Account Tax Compliance Act," a non-U.S. holder generally will not be subject to U.S. federal income tax on gain recognized on a sale, exchange or other taxable disposition of shares of our common stock or warrants unless:

- the gain is effectively connected with the non-U.S. holder's conduct of a trade or business in the United States and, if an applicable income tax treaty so provides, the gain is attributable to a permanent establishment or fixed base maintained by the non-U.S. holder in the United States; in these cases, the non-U.S. holder will be taxed on a net income basis at the regular graduated rates and in the manner applicable to a U.S. holder, and, if the non-U.S. holder is a corporation, an additional branch profits tax at a rate of 30%, or a lower rate as may be specified by an applicable income tax treaty, may also apply;
- the non-U.S. holder is an individual present in the United States for 183 days or more in the taxable year of the disposition and certain other conditions are met, in which case the non-U.S. holder will be subject to a 30% tax (or such lower rate as may be specified by an applicable income tax treaty) on the amount by which such non-U.S. holder's capital gains allocable to U.S. sources exceed capital losses allocable to U.S. sources during the taxable year of the disposition; or
- we are or were a "U.S. real property holding corporation" during the shorter of the five-year period ending on the date of the disposition or the period that the non-U.S. holder held shares of our common stock. Generally, a corporation is a "U.S. real property holding corporation" if the fair market value of its "U.S. real property interests" (within the meaning of the Code) equals or exceeds 50% of the sum of the fair market value of its worldwide real property interests plus its other assets used or held for use in a trade or business. We believe that we are not currently, and we do not anticipate becoming, a "U.S. real property holding corporation" for U.S. federal income tax purposes. Even if we are treated as a U.S. real property holding corporation, gain realized by a non-U.S. holder on a disposition of shares 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 five percent 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) shares of our common stock

are regularly traded on an established securities market as set forth in the applicable U.S. Treasury Regulations. There can be no assurance that shares of our common stock will qualify as regularly traded on an established securities market at the time of disposition. Disposition by a non-U.S. holder of our warrants (that are not expected to be regularly traded on an established securities market) may also be eligible for an exemption from withholding even if we are treated as a U.S. real property holding corporation, if on the date such warrants were acquired by such non-U.S. holder such holdings had a fair market value no greater than the fair market value on that date of five percent of our regularly-traded common stock, provided that, if a non-U.S. holder holding our not regularly-traded warrants subsequently acquires additional such securities, then such interests would be aggregated and valued as of the date of the subsequent acquisition in order to apply this five percent limitation. Non-U.S. holders should consult their own tax advisors.

Dividend Equivalents

Section 871(m) of the Code requires withholding (up to 30%, depending on whether a treaty applies) on certain financial instruments to the extent that the payments or deemed payments on the financial instruments are contingent upon or determined by reference to U.S.-source dividends. Under U.S. Treasury Regulations promulgated under Section 871(m), certain payments or deemed payments to non-U.S. holders with respect to certain equity-linked instruments, or specified ELIs, that reference U.S. stocks may be treated as dividend equivalents ("dividend equivalents") that are subject to U.S. withholding tax at a rate of 30% (or lower treaty rate). Under these U.S. Treasury Regulations, withholding may be required even in the absence of any actual dividend related payment or adjustment made pursuant to the terms of the instrument. Under U.S. Treasury Regulations promulgated under Section 871(m) and other IRS guidance, Section 871(m) will apply to financial instruments issued in 2018 only if they are "delta-one." A "delta-one" instrument is one in which the ratio of the change in the fair market value of the instrument to a small change in the fair market value of the property referenced by the instrument is equal to 1.00. We do not believe that the warrants are delta-one instruments. Accordingly, non-U.S. holders of the warrants should not be subject to tax under Section 871(m). However, if withholding is required, we (or the applicable paying agent) would be entitled to withhold such taxes without being required to pay any additional amounts with respect to amounts so withheld. Non-U.S. Holders should consult with their tax advisors regarding the application of Section 871(m) and the regulations thereunder in respect of their acquisition and ownership of the warrants.

Foreign Account Tax Compliance Act

Legislation commonly known as the Foreign Account Tax Compliance Act, or FATCA, and guidance issued thereunder may impose withholding taxes on certain types of payments made to "foreign financial institutions" (as specifically defined) and certain other non-U.S. entities (including financial intermediaries). Under FATCA, failure to comply with certification, information reporting and other specified requirements could result in withholding tax being imposed on payments of dividends and sales proceeds of any property of a type which can produce U.S. source dividends to foreign intermediaries and certain non-U.S. holders. FATCA imposes a 30% withholding tax on dividends or gross proceeds from the sale or other disposition of the shares of our common stock paid to a foreign financial institution or to a non-financial foreign entity, unless (i) the foreign financial institution undertakes certain diligence and reporting obligations, (ii) the non-financial foreign entity either certifies it does not have any "substantial United States owners" as specifically defined in FATCA or furnishes identifying information regarding each substantial United States owner or (iii) the foreign financial institution or the non-financial foreign entity qualifies for an exemption from the withholding tax. We intend to treat the warrants as also subject to FATCA. If the payee is a foreign financial institution, in the absence of any applicable exemption, it must enter into an agreement with the United States Treasury requiring, among other things, that it undertake to identify accounts held by certain United States persons or United States-owned foreign entities, annually report certain information about such accounts, and withhold 30% on "withholdable payments" (as specifically defined) made to certain account holders. An intergovernmental agreement between the United States and the foreign entity's jurisdiction may modify these requirements. Under certain transition rules, any obligation to withhold under FATCA with respect to payments of dividends on the common stock and warrants is

currently in effect, but with respect to the gross proceeds of a sale or other disposition of the warrants or the common stock the obligation to withhold under FATCA will not begin until January 1, 2019. Prospective investors should consult their tax advisors regarding the implications of FATCA with respect to an investment in the units.

Information Reporting and Backup Withholding Applicable to U.S. Holders and Non-U.S. Holders

Distributions on, and the payment of the proceeds of a disposition of, shares of our common stock or warrants generally will be subject to information reporting if made within the United States or through certain U.S.-related financial intermediaries. Information returns are required to be filed with the IRS and copies of information returns may be made available to the tax authorities of the country in which a holder resides or is incorporated under the provisions of a specific treaty or agreement.

Backup withholding may also apply if the holder fails to provide certification of exempt status or a correct U.S. taxpayer identification number and otherwise comply with the applicable backup withholding requirements. Generally, a holder will not be subject to backup withholding if it provides a properly completed and executed IRS Form W-9 or appropriate IRS Form W-8, as applicable. Backup withholding is not an additional tax. Amounts withheld under the backup withholding rules may be refunded or credited against the holder's U.S. federal income tax liability, if any, provided certain information is timely filed with the IRS.

The preceding discussion of U.S. federal tax considerations is for general information only. It is not tax advice. Each prospective investor should consult its tax advisor regarding the particular U.S. federal, state and local and non-U.S. tax consequences of purchasing, holding and disposing of our common stock or common warrants, including the consequences of any recent or proposed change in applicable laws.

UNDERWRITING

We have entered into an underwriting agreement with Roth Capital Partners, LLC, acting as the representative of the underwriters named below, with respect to the units subject to this offering. Subject to certain conditions, we have agreed to sell to the underwriters, and the underwriters have agreed to purchase, the number of units provided below opposite their respective names.

Underwriter	Number of Units
Roth Capital Partners, LLC	
Maxim Group LLC	
LifeSci Capital LLC	
Total	2,450,000

The underwriters are offering the units, subject to their acceptance of the units 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 securities 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 securities if any such securities are taken. However, the underwriters are not required to take or pay for the securities covered by the underwriters' over-allotment option described below.

Over-Allotment Option

We have granted the underwriters an option, exercisable for 30 days from the date of this prospectus, to purchase up to 367,500 units to cover over-allotments, if any, at the public offering price set forth 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 securities offered by this prospectus. If the underwriters exercise this option, each underwriter will be obligated, subject to certain conditions, to purchase a number of additional units proportionate to that underwriter's initial purchase commitment as indicated in the table above.

Commission and Expenses

The underwriters have advised us that they propose to offer the units to the public at the initial public offering price set forth on the cover page of this prospectus and to certain dealers at that price less a concession not in excess of $ per unit. The underwriters may allow, and certain dealers may re-allow, a discount from the concession not in excess of $ per unit to certain brokers and dealers. After this offering, the initial public offering price, concession and reallowance to dealers may be reduced by the representatives. No such reduction shall change the amount of proceeds to be received by us as set forth on the cover page of this prospectus. The units are offered by the underwriters as stated herein, subject to receipt and acceptance by them and subject to their right to reject any order in whole or in part. The underwriters have informed us that they do not intend to confirm sales to any accounts over which they exercise discretionary authority.

The following table shows the underwriting discounts and commissions payable to the underwriters by us in connection with this offering. Such amounts are shown assuming both no exercise and full exercise of the underwriters' over-allotment option to purchase securities.

	Without Exercise of Over-Allotment(1)	With Full Exercise of Over-Allotment(1)
Public offering price per unit	$	$
Total	$	$

(1) The fees do not include the Underwriter's Warrants or expense reimbursement provisions described below.

We have also agreed to issue to the underwriters warrants to purchase shares of common stock collectively equal to an aggregate of 3% of the shares of common stock underlying the units issued in the offering. The underwriter warrants will have an exercise price per share equal to 150% of the offering price per unit sold in this offering and may be exercised on a cashless basis. The underwriter warrants are exercisable commencing one year after the effective date of the registration statement related to this offering, and will be exercisable for four years thereafter. The underwriter warrants are not redeemable by us. The warrants and the shares of common stock underlying the warrants, have been deemed compensation by FINRA and are therefore subject to a 180-day lock-up pursuant to Rule 5110(g)(1) of FINRA. The underwriters (or permitted assignees under the Rule) may not sell, transfer, assign, pledge, or hypothecate the underwriter warrants or the shares of common stock underlying the underwriter warrants, nor will they engage in any hedging, short sale, derivative, put, or call transaction that would result in the effective economic disposition of the underwriter warrants or the underlying shares of common stock for a period of 180 days from the date of this prospectus. Additionally, the underwriter warrants may not be sold transferred, assigned, pledged or hypothecated for a 180 day period following the effective date of the registration statement except to any underwriter and selected dealer participating in the offering and their bona fide officers or partners. The underwriter warrants will provide for adjustment in the number and price of such underwriter warrants and the shares of common stock underlying such warrants in the event of recapitalization, merger or other structural transaction to prevent mechanical dilution.

We have also agreed to reimburse the underwriters for certain out-of-pocket expenses incurred by them, including fees and disbursements of their counsel up to an aggregate of $150,000, with respect to this offering.

We estimate that expenses payable by us in connection with the offering of our common stock, other than the underwriting discounts and commissions and the counsel fees and disbursement reimbursement provisions referred to above, will be approximately $2.5 million.

Indemnification

We have agreed to indemnify the underwriters against certain liabilities, including liabilities under the Securities Act and liabilities arising from breaches of representations and warranties contained in the underwriting agreement, or to contribute to payments that the underwriters may be required to make in respect of those liabilities.

Lock-Up Agreements

Our executive officers, directors and certain of our stockholders, which represent substantially all of our currently outstanding shares of common stock, have agreed to a 180-day (except for our chief executive officer, who has agreed to 18 months) “lock-up” from the effective date of this prospectus of shares of our common stock that they beneficially own, including the issuance of common stock upon the exercise of currently outstanding convertible securities and options and options which may be issued. This means that, for a period of 180 days following the effective date of this prospectus, such persons may not offer, sell, pledge or otherwise dispose of these securities without the prior written consent of the representative of the underwriters. The lock-up period described in the preceding paragraph will be extended if the Company ceases to be an “emerging growth company” at any time prior to the expiration of the lock-up period and if (1) during the last 17 days of the lock-up period we issue an earnings release or material news or a material event relating to us occurs or (2) prior to the expiration of the lock-up period we announce that we will release earnings results during the 16-day period beginning on the last day of the lock-up period, in which case the lock-up period will be extended until the expiration of the 18-day period beginning on the date of issuance of the earnings release or the occurrence of the material news or material event.

The representative of the underwriters has no present intention to waive or shorten the lock-up period; however, the terms of the lock-up agreements may be waived at its discretion. In determining whether to waive the terms of the lockup agreements, the representative of the underwriters may base its decision on its assessment of the relative strengths of the securities markets and companies similar to ours in general, and the trading pattern of, and demand for, our securities in general.

In addition, the underwriting agreement provides that, subject to certain exceptions, we will not, for a period of 180 days following the effective date of this prospectus, offer, sell or distribute any of our securities or file any registration statement with the commission relating to the offering of any shares of Common Stock or any securities convertible into or exchangeable for Common Stock, without the prior written consent of the representative of the underwriters.

Listing

Our common stock has been approved for listing on The Nasdaq Stock Market LLC under the symbol “BNGO” and we have applied for the listing on The Nasdaq Stock Market LLC of the units and the warrants under the symbols “BNGOU” and “BNGOW,” respectively.

Electronic Distribution

A prospectus in electronic format may be made available on websites or through other online services maintained by one or more of the underwriters of this offering, or by their affiliates. Other than the prospectus in electronic format, the information on any underwriter’s website and any information contained in any other website maintained by an underwriter is not part of this prospectus or the registration statement of which this prospectus forms a part, has not been approved and/or endorsed by us or any underwriter in its capacity as underwriter, and should not be relied upon by investors.

Price Stabilization, Short Positions and Penalty Bids

In connection with the offering the underwriters may engage in stabilizing transactions, over-allotment transactions, syndicate covering transactions and penalty bids in accordance with Regulation M under the Exchange Act:

- Stabilizing transactions permit bids to purchase the underlying security so long as the stabilizing bids do not exceed a specified maximum.
- Over-allotment involves sales by the underwriters of shares in excess of the number of shares the underwriters are obligated to purchase, which creates a syndicate short position. The short position may be either a covered short position or a naked short position. In a covered short position, the number of shares over-allotted by the underwriter is not greater than the number of shares that it may purchase in the over-allotment option. In a naked short position, the number of shares involved is greater than the number of shares in the over-allotment option. The underwriter may close out any covered short position by either exercising its over-allotment option and/or purchasing shares in the open market.
- Syndicate covering transactions involve purchases of shares of the common stock in the open market after the distribution has been completed in order to cover syndicate short positions. In determining the source of shares to close out the short position, the underwriters will consider, among other things, the price of shares available for purchase in the open market as compared to the price at which it may purchase shares through the over-allotment option. If the underwriters sell more shares than could be covered by the over-allotment option, a naked short position, the position can only be closed out by buying shares in the open market. A naked short position is more likely to be created if the underwriters are concerned that there could be downward pressure on the price of the shares in the open market after pricing that could adversely affect investors who purchase in the offering.
- Penalty bids permit the representative to reclaim a selling concession from a syndicate member when the common stock originally sold by the syndicate member is purchased in a stabilizing or syndicate covering transaction to cover syndicate short positions.

These stabilizing transactions, syndicate covering transactions and penalty bids may have the effect of raising or maintaining the market price of our securities or preventing or retarding a decline in the market price of our securities. As a result, the price of our securities may be higher than the price that might otherwise exist in

the open market. Neither we nor the underwriters makes any representation or prediction as to the direction or magnitude of any effect that the transactions described above may have on the price of our securities. In addition, neither we nor the underwriters makes any representations that the underwriters will engage in these stabilizing transactions or that any transaction, once commenced, will not be discontinued without notice.

No Public Market

Prior to this offering, there has not been a public market for our securities in the U.S. and the public offering price for our securities will be determined through negotiations between us and the underwriters. Among the factors to be considered in these negotiations will be prevailing market conditions, our financial information, market valuations of other companies that we and the underwriters believe to be comparable to us, estimates of our business potential, the present state of our development and other factors deemed relevant.

We offer no assurances that the initial public offering price will correspond to the price at which our securities will trade in the public market subsequent to this offering or that an active trading market for our securities will develop and continue after this offering.

Notice to Prospective Investors in the European Economic Area

In relation to each Member State of the European Economic Area ("EEA") which has implemented the Prospectus Directive (each, a "Relevant Member State") an offer to the public of any shares which are the subject of the offering contemplated by this prospectus may not be made in that Relevant Member State, except that an offer to the public in that Relevant Member State of any shares 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 legal entities which are authorized or regulated to operate in the financial markets or, if not so authorized or regulated, whose corporate purpose is solely to invest in securities;

(b) to any legal entity which has two or more of (1) an average of at least 250 employees during the last financial year; (2) a total balance sheet of more than €43,000,000 and (3) an annual net turnover of more than €50,000,000, as shown in its last annual or consolidated accounts;

(c) by the underwriters 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) subject to obtaining the prior consent of the representatives for any such offer; or

(d) in any other circumstances falling within Article 3(2) of the Prospectus Directive;

provided that no such offer of shares shall result in a requirement for the publication by us or any representative of a prospectus pursuant to Article 3 of the Prospectus Directive.

Any person making or intending to make any offer of shares within the EEA should only do so in circumstances in which no obligation arises for us or any of the underwriters to produce a prospectus for such offer. Neither we nor the underwriters have authorized, nor do they authorize, the making of any offer of shares through any financial intermediary, other than offers made by the underwriters which constitute the final offering of shares contemplated in this prospectus.

For the purposes of this provision, and your representation below, the expression an "offer to the public" in relation to any shares 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 to be offered so as to enable an investor to decide to purchase any shares, as the same may be varied in that Relevant Member State by any measure implementing the Prospectus Directive in that Relevant Member State and the expression "Prospectus Directive" means Directive 2003/71/EC and includes any relevant implementing measure in each Relevant Member State, including the 2010 PD Amending Directive, to the extent implemented in the Relevant Member State. The expression "2010 PD Amending Directive" means Directive 2010/73/EU.

Each person in a Relevant Member State who receives any communication in respect of, or who acquires any shares under, the offer of shares contemplated by this prospectus will be deemed to have represented, warranted and agreed to and with us and each underwriter that:

(A) it is a "qualified investor" within the meaning of the law in that Relevant Member State implementing Article 2(1)(e) of the Prospectus Directive; and

(B) in the case of any shares acquired by it as a financial intermediary, as that term is used in Article 3(2) of the Prospectus Directive, (i) the shares acquired by it in the offering have not been acquired on behalf of, nor have they been acquired with a view to their offer or resale to, persons in any Relevant Member State other than "qualified investors", as defined in the Prospectus Directive, or in circumstances in which the prior consent of the representatives has been given to the offer or resale; or (ii) where shares have been acquired by it on behalf of persons in any Relevant Member State other than qualified investors, the offer of those shares to it is not treated under the Prospectus Directive as having been made to such persons.

In addition, in the United Kingdom, this document is being distributed only to, and is directed only at, and any offer subsequently made may only be directed at persons who are "qualified investors", as defined in the Prospectus Directive, (i) who have professional experience in matters relating to investments falling within Article 19 (5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005, as amended, or the order, and/or (ii) who are high net worth companies (or persons to whom it may otherwise be lawfully communicated) falling within Article 49(2)(a) to (d) of the Order (all such persons together being referred to as "relevant persons"). This document must not be acted on or relied on in the United Kingdom by persons who are not relevant persons. In the United Kingdom, any investment or investment activity to which this document relates is only available to, and will be engaged in with, relevant persons.

Other Relationships

Some of the underwriters and their affiliates have engaged in, and may in the future engage in, investment banking and other commercial dealings in the ordinary course of business with us or our affiliates. They have received, or may in the future receive, customary fees and commissions for these transactions.

LEGAL MATTERS

Cooley LLP, San Diego, California, which has acted as our counsel in connection with this offering, will pass on certain legal matters with respect to U.S. federal law in connection with this offering. Loeb & Loeb LLP, New York, New York, has acted as counsel to the underwriters in connection with this offering.

EXPERTS

The consolidated financial statements included in this Prospectus have been audited by Deloitte & Touche LLP, an independent registered public accounting firm, as stated in their report appearing herein (which report expresses an unqualified opinion on the consolidated financial statements and includes an explanatory paragraph referring to the Company's ability to continue as a going concern). 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.

WHERE YOU CAN FIND ADDITIONAL INFORMATION

We have filed with the SEC a registration statement on Form S-1 under the Securities Act with respect to the securities offered by this prospectus. This prospectus, which constitutes a part of the registration statement, does not contain all the information set forth in the registration statement, some of which is contained in exhibits to the registration statement as permitted by the rules and regulations of the SEC. For further information with respect to us and our securities, we refer you to the registration statement, including the exhibits filed as a part of the registration statement. Statements contained in this prospectus concerning the contents of any contract or any other document are not necessarily complete. If a contract or document has been filed as an exhibit to the registration statement, please see the copy of the contract or document that has been filed. Each statement in this prospectus relating to a contract or document filed as an exhibit is qualified in all respects by the filed exhibit. You may obtain copies of this information by mail from the Public Reference Section of the SEC, 100 F Street, N.E., Room 1580, Washington, D.C. 20549, at prescribed rates. You may obtain information on the operation of the public reference rooms by calling the SEC at 1-800-SEC-0330. The SEC also maintains an internet website that contains reports and other information about issuers, like us, that file electronically with the SEC. The address of that website is www.sec.gov.

On the closing of this offering, we will be subject to the information reporting requirements of the Exchange Act, 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 and copying at the public reference room and website of the SEC referred to above.

We also maintain a website at www.amplyx.com. Information contained in, or accessible through, our website is not a part of this prospectus, and the inclusion of our website address in this prospectus is only as an inactive textual reference.

Bionano Genomics, Inc.

Index to Consolidated Financial Statements

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the stockholders and Board of Directors of Bionano Genomics, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Bionano Genomics, Inc. and its subsidiaries (the "Company"), as of December 31, 2016 and 2017 and the related consolidated statements of operations, consolidated statements of convertible preferred stock and stockholders' deficit, and consolidated statements of cash flows for each of the two years in the period ended December 31, 2017 and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2016 and 2017, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2017, in conformity with accounting principles generally accepted in the United States of America.

Going Concern

The accompanying financial statements have been prepared assuming that the Company will continue as a going concern. As discussed in Note 1 to the financial statements, the Company has suffered recurring losses from operations and has a net capital deficiency that raises substantial doubt about its ability to continue as a going concern. Management's plans in regard to these matters are also described in Note 1. The financial statements do not include any adjustments that might result from the outcome of this uncertainty.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits, we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Deloitte & Touche, LLP

San Diego, California
May 11, 2018 (July 16, 2018 as to the effects of the reverse stock split and August 15, 2018 as to the effects of the second reverse stock split, both described in Note 12)

We have served as the Company's auditor since 2017.

Bionano Genomics, Inc.

Consolidated Balance Sheets

	December 31, 2016	December 31, 2017	June 30, 2018 (unaudited)	Pro Forma Liabilities, Convertible Preferred Stock, and Stockholders' (Deficit) Equity June 30, 2018 (unaudited)
Assets				
Current assets:				
Cash and cash equivalents	$ 5,249,620	$ 1,021,897	$ 7,624,289	
Accounts receivable, net	1,846,567	3,352,214	2,886,205	
Inventory	1,797,401	1,693,742	1,972,938	
Prepaid expenses and other current assets	1,842,066	1,071,512	3,170,223	
Total current assets	10,735,654	7,139,365	15,653,655	
Property and equipment, net	4,052,083	3,005,788	2,440,501	
Total assets	$ 14,787,737	$ 10,145,153	$ 18,094,156	
Liabilities, convertible preferred stock, and stockholders' deficit				
Current liabilities:				
Accounts payable	$ 792,332	$ 2,302,964	$ 1,752,325	$ 1,752,325
Accrued expenses	2,886,726	3,508,894	4,498,872	4,498,872
Deferred revenue	446,769	211,697	241,196	241,196
Preferred stock warrant liability	4,650,877	3,898,944	1,604,836	—
Current portion of long-term debt	587,131	6,729,752	—	—
Convertible note	—	—	14,329,843	—
Total current liabilities	9,363,835	16,652,251	22,427,072	6,492,393
Long-term debt, net of current portion	6,046,045	—	8,956,143	8,956,143
Long-term deferred revenue	244,884	142,929	144,601	144,601
Other non-current liabilities	975,418	567,047	833,814	833,814
Total liabilities	16,630,182	17,362,227	32,361,630	16,426,951
Commitments and contingencies (Note 9)				
Series A convertible preferred stock, $0.0001 par value; 418,767 shares authorized as of December 31, 2016 and 2017 and June 30, 2018 (unaudited); 345,587 shares issued and outstanding as of December 31, 2016 and 2017 and June 30, 2018 (unaudited); $483,649 liquidation preference at December 31, 2017 and June 30, 2018 (unaudited); no shares authorized, issued or outstanding pro forma at June 30, 2018 (unaudited)	61,847	61,847	61,847	—
Series B convertible preferred stock, $0.0001 par value; 8,101,042 shares authorized as of December 31, 2016 and 2017 and June 30, 2018 (unaudited); 8,058,170 shares issued and outstanding as of December 31, 2016 and 2017 and June 30, 2018 (unaudited); $11,277,409 liquidation preference at December 31, 2017 and June 30, 2018 (unaudited); no shares authorized, issued or outstanding pro forma at June 30, 2018 (unaudited)	842,845	842,845	842,845	—
Series B-1 convertible preferred stock, $0.0001 par value; 7,523,734 shares authorized as of December 31, 2016 and 2017 and June 30, 2018 (unaudited); 3,437,950 shares issued and outstanding as of December 31, 2016 and 2017 and June 30, 2018 (unaudited); $4,811,411 liquidation preference at December 31, 2017 and June 30, 2018 (unaudited); no shares authorized, issued or outstanding pro forma at June 30, 2018 (unaudited)	359,593	359,593	359,593	—

	December 31,		June 30,	Pro Forma Liabilities, Convertible Preferred Stock, and Stockholders' (Deficit) Equity
	2016	2017	2018 (unaudited)	June 30, 2018 (unaudited)
Series C convertible preferred stock, $0.0001 par value; 23,357,047 shares authorized as of December 31, 2016 and 2017 and June 30, 2018 (unaudited); 23,357,047 shares issued and outstanding as of December 31, 2016 and 2017 and June 30, 2018 (unaudited); $32,800,301 liquidation preference at December 31, 2017 and June 30, 2018 (unaudited); no shares authorized, issued or outstanding pro forma at June 30, 2018 (unaudited)	5,547,841	5,547,841	5,547,841	—
Series D convertible preferred stock, $0.0001 par value; 52,835,720 shares authorized as of December 31, 2016 and 2017 and June 30, 2018 (unaudited), respectively; 20,652,486 shares issued and outstanding as of December 31, 2016 and 2017 and June 30, 2018 (unaudited), respectively; $9,913,193 liquidation preference at December 31, 2017 and June 30, 2018 (unaudited), respectively; no shares authorized, issued or outstanding pro at June 30, 2018 (unaudited)	4,838,379	4,838,379	4,838,379	—
Series D-1 convertible preferred stock, $0.0001 par value; 73,208,367, 125,808,667 and 126,746,167 shares authorized as of December 31, 2016 and 2017 and June 30, 2018 (unaudited), respectively; 29,166,671, 66,141,257 and 66,141,257 shares issued and outstanding as of December 31, 2016 and 2017, and June 30, 2018 (unaudited) respectively; $31,747,803 liquidation preference at December 31, 2017 and June 30, 2018 (unaudited); no shares authorized, issued or outstanding pro at June 30, 2018 (unaudited)	13,766,022	31,359,632	31,359,632	—
Stockholders' deficit:				
Common stock, $0.0001 par value; 190,559,820, 243,160,120 and 244,097,620 shares authorized at December 31, 2016 and 2017 and June 30, 2018 (unaudited), respectively; 70,178, 77,257 and 78,045 shares issued and outstanding as of December 31, 2016 and 2017 and June 30, 2018 (unaudited), respectively; 5,946,637 shares issued and outstanding proforma at June 30, 2018	7	8	8	595
Additional paid-in capital	3,641,693	4,038,817	4,147,255	63,091,484
Accumulated deficit	(30,900,672)	(54,266,036)	(61,424,874)	(61,424,874)
Total stockholders' (deficit) equity	(27,258,972)	(50,227,211)	(57,277,611)	1,667,205
Total liabilities, convertible preferred stock, and stockholders' deficit	$ 14,787,737	$ 10,145,153	$ 18,094,156	

See accompanying notes

Bionano Genomics, Inc.

Consolidated Statements of Operations

	Year Ended December 31,		Six Months Ended June 30,	
	2016	2017	2017	2018
			(unaudited)	
Revenue:				
Product revenue	$ 6,153,355	$ 8,769,704	$ 3,609,281	$ 4,918,245
Other revenue	639,434	735,339	307,583	240,249
Total revenue	6,792,789	9,505,043	3,916,864	5,158,494
Operating expenses:				
Cost of product revenue	3,459,771	5,958,537	2,818,861	2,644,043
Cost of other revenue	118,921	71,975	25,256	10,836
Research and development	11,431,941	12,009,170	6,584,614	4,465,919
Selling, general and administrative	12,950,572	14,079,658	7,436,426	6,385,378
Impairment of property and equipment	—	604,511	—	—
Total operating expenses	27,961,205	32,723,851	16,865,157	13,506,176
Loss from operations	(21,168,416)	(23,218,808)	(12,948,293)	(8,347,682)
Other income (expense)				
Interest expense	(470,072)	(590,927)	(286,095)	(709,616)
Change in fair value of preferred stock warrants and expirations	3,006,082	751,933	953,893	2,470,921
Other expense	(203,285)	(289,010)	(57,135)	(563,179)
Total other income (expenses)	2,332,725	(128,004)	610,663	1,198,126
Loss before income taxes	(18,835,691)	(23,346,812)	(12,337,630)	(7,149,556)
Provision for income taxes	(12,924)	(18,552)	(22,358)	(9,282)
Net loss	$ (18,848,615)	$ (23,365,364)	$ (12,359,988)	$ (7,158,838)
Net loss per share, basic and diluted:	$ (312.46)	$ (327.78)	$ (176.12)	$ (92.23)
Weighted-average common shares outstanding, basic and diluted	60,323	71,283	70,178	77,618
Pro forma net loss per share, basic and diluted (unaudited)		$ (8.65)		$ (1.40)
Pro forma weighted-average common shares outstanding, basic and diluted (unaudited)		2,701,065		5,095,468

See accompanying notes

Bionano Genomics, Inc.

Consolidated Statements of Convertible Preferred Stock and Stockholders' Deficit

	Series A Convertible Preferred Stock		Series B Convertible Preferred Stock		Series B-1 Convertible Preferred Stock		Series C Convertible Preferred Stock		Series D Convertible Preferred Stock		Series D-1 Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Deficit	Total Stockholders' Deficit
	Shares	Amount	Shares	Amount	Shares	Amount	Shares	Amount	Shares	Amount	Shares	Amount	Shares	Amount			
Balance at January 1, 2016	1,908,757	$ 4,989,018	17,195,333	$ 23,909,095	7,441,599	$10,359,042	37,752,481	$ 48,930,547					103,728	$ 10	$3,509,189	$ (93,428,106)	$ (89,918,907)
Mandatory conversion of Series A, B and C preferred stock	(1,563,170)	(4,927,171)	(9,137,163)	(23,066,250)	(4,003,649)	(9,999,449)	(14,395,434)	(43,382,706)					679,890	68	2,849	81,376,049	81,378,966
10-to-1 reverse stock split	—	—	—	—	—	—	—	—	—	—	—	—	(705,588)	(70)	(2,950)	—	(3,020)
Common stock share cancellations	—	—	—	—	—	—	—	—	—	—	—	—	(8,190)	(1)	1	—	—
Issuance of Series D convertible preferred stock, net of issuance cost and warrant fair value of $5,140,463	—	—	—	—	—	—	—	—	20,652,486	4,838,379	—	—	—	—	—	—	—
Issuance of Series D-1 convertible preferred stock, net of issuance cost of $200,002	—	—	—	—	—	—	—	—	—	—	29,166,671	13,766,022	—	—	—	—	—
Issuance of common stock	—	—	—	—	—	—	—	—	—	—	—	—	338	0	1,961	—	1,961
Stock-based compensation expense	—	—	—	—	—	—	—	—	—	—	—	—	—	—	130,643	—	130,643
Net loss	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(18,848,615)	(18,848,615)
Balance at December 31, 2016	345,587	61,847	8,058,170	842,845	3,437,950	359,593	23,357,047	5,547,841	20,652,486	4,838,379	29,166,671	13,766,022	70,178	7	3,641,693	(30,900,672)	(27,258,972)
Issuance of Series D-1 convertible preferred stock, net of issuance cost of $154,191	—	—	—	—	—	—	—	—	—	—	36,974,586	17,593,610	—	—	—	—	—
Issuance of common stock	—	—	—	—	—	—	—	—	—	—	—	—	7,079	1	14,294	—	14,295
Stock-based compensation expense	—	—	—	—	—	—	—	—	—	—	—	—	—	—	382,830	—	382,830
Net loss	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(23,365,364)	(23,365,364)
Balance at December 31, 2017	345,587	$ 61,847	8,058,170	$ 842,845	3,437,950	$ 359,593	23,357,047	$ 5,547,841	20,652,486	$4,838,379	66,141,257	$31,359,632	77,257	$ 8	$4,038,817	$ (54,266,036)	$ (50,227,211)
Issuance of common stock (unaudited)	—	—	—	—	—	—	—	—	—	—	—	—	788	0	1,012	—	1,012
Stock-based compensation expense (unaudited)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	107,426	—	107,426
Net loss (unaudited)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(7,158,838)	(7,158,838)
Balance at June 30, 2018 (unaudited)	345,587	$ 61,847	8,058,170	$ 842,845	3,437,950	$ 359,593	23,357,047	$ 5,547,841	20,652,486	$4,838,379	66,141,257	$31,359,632	78,045	$ 8	$4,147,255	$ (61,424,874)	$ (57,277,611)

See accompanying notes

Bionano Genomics, Inc.

Consolidated Statements of Cash Flows

	Year Ended December 31,		Six Months Ended June 30,	
	2016	2017	2017	2018
			(unaudited)	
Operating activities:				
Net loss	$ (18,848,615)	$ (23,365,364)	$ (12,359,988)	$ (7,158,838)
Adjustments to reconcile net loss to cash used in operating activities:				
Depreciation and amortization expense	1,115,027	1,504,042	724,381	778,555
Change in fair value of preferred stock warrants and expirations	(3,006,082)	(751,933)	(953,893)	(2,470,921)
Stock-based compensation	130,643	382,830	217,846	107,426
Provision for bad debt expense	—	262,000	—	238,000
Inventory write-off	—	364,437	364,437	—
Impairment of property and equipment	—	604,511	—	—
Accretion of debt discount	73,902	96,576	44,682	60,655
Loss on debt extinguishment	—	—	—	342,164
Changes in operating assets and liabilities:				
Accounts receivable	(856,098)	(1,767,647)	469,869	228,009
Inventory	(726,138)	(336,046)	(665,841)	(172,578)
Prepaid expenses and other current assets	(782,217)	770,553	(371,390)	(697,361)
Accounts payable	(608,653)	1,541,472	343,725	(1,058,391)
Accrued expenses and other liabilities	11,873	(123,229)	(167,346)	49,359
Net cash used in operating activities	(23,496,358)	(20,817,798)	(12,353,518)	(9,753,921)
Investing activities:				
Purchases of property and equipment	(1,349,853)	(1,017,830)	(461,939)	(189,401)
Net cash used in investing activities	(1,349,853)	(1,017,830)	(461,939)	(189,401)
Financing activities:				
Repayment of notes payable	(5,000,000)	—	—	(7,447,571)
Proceeds from issuance of long-term debt, net of offering costs	6,886,458	—	—	9,662,430
Proceeds from issuance of convertible note, net of offering costs	—	—	—	14,329,843
Proceeds from issuance of preferred stock and warrants, net of offering costs	23,542,642	17,593,610	8,982,647	—
Proceeds received in advance of issuance of preferred stock and warrants, net of offering costs	—	—	4,249,481	—
Proceeds from option exercises	1,961	14,295	—	1,012
Net cash provided by financing activities	25,431,061	17,607,905	13,232,128	16,545,714
Net increase (decrease) in cash and cash equivalents	584,850	(4,227,723)	416,671	6,602,392
Cash and cash equivalents at beginning of period	4,664,770	5,249,620	5,249,620	1,021,897
Cash and cash equivalents at end of period	$ 5,249,620	$ 1,021,897	$ 5,666,291	$ 7,624,289
Supplementary schedule on non-cash transactions:				
Transfer of instruments to property and equipment from inventory	$ 40,347	$ 75,268	$ —	$ 106,617
Property and equipment costs incurred but not paid included in accounts payable and and accrued expenses	$ 42,670	$ 11,830	$ —	$ 130,484
Leasehold improvements financed by landlord through lease incentives	$ 1,050,244	$ —	$ —	$ —
Fair value of warrants issued with equity classified as a liability	$ 4,938,241	$ —	$ —	$ —
Fair value of warrants issued with debt classified as a liability	$ 99,684	$ —	$ —	$ 176,813
Final payment fee due in connection with the repayment of debt classified within other long-term liabilities	$ 227,500	$ —	$ —	$ 400,000
Deferred equity issuance costs in accounts payable and accrued liabilities	$ —	$ —	$ —	$ 1,401,350
Debt issuance costs incurred but not paid	$ —	$ —	$ —	$ 129,474
Supplementary disclosure of cash flow information				
Interest paid	$ 446,525	$ 534,858	$ 259,953	$ 299,528

See accompanying notes

Bionano Genomics, Inc.

Notes to Consolidated Financial Statements
(Information as of June 30, 2018 and for the six months ended June 30, 2017 and 2018 is unaudited)

1. Organization and Basis of Presentation

Description of Business

Bionano Genomics, Inc. (the "Company") was incorporated in Delaware on August 16, 2007, under the name BioNanomatrix, Inc. On October 11, 2011, the Company changed its name to BioNano Genomics, Inc. Upon the filing of the Company's amended and restated certificate of incorporation immediately prior to the closing of its public offering, the Company's name will be changed to Bionano Genomics, Inc. The Company is developing and commercializing genomic mapping instruments and technology to enable researchers to analyze DNA through unique studies to gain a comprehensive picture of genome biology, including structural variation of DNA and chromosomes.

The accompanying consolidated financial statements (the "financial statements") have been prepared assuming the Company will continue as a going concern, which contemplates continuity of operations, the realization of assets and the satisfaction of liabilities in the normal course of business. The financial statements do not reflect any adjustments that might result if the Company is unable to continue as a going concern. Since inception, the Company has been engaged in organizational activities, including raising capital and research and development activities. The Company has not generated substantial revenues and has not yet achieved profitable operations, nor has it ever generated positive cash flows from operations. There is no assurance that profitable operations, if achieved, could be sustained on a continuing basis. Further, the Company's future operations are dependent on the success of the Company's efforts to raise additional capital and the market acceptance of the Company's products. There can be no assurance that these efforts will be successful.

Going Concern

In accordance with ASU 2014-15, *Presentation of Financial Statements – Going Concern (Subtopic 205-40): Disclosure of Uncertainties About an Entity's Ability to Continue as a Going Concern*, management is required to perform a two-step analysis over its ability to continue as a going concern. Management must first evaluate whether there are conditions and events that raise substantial doubt about the Company's ability to continue as a going concern and to meet its obligations as they become due within one year after the date that the financial statements are issued (step 1). If management concludes that substantial doubt is raised, management is also required to consider whether its plans alleviate that doubt (step 2).

The Company has experienced net losses and negative cash flows from operating activities since its inception and expects to continue to incur net losses into the foreseeable future. The Company had an accumulated deficit of $54,266,036 and $61,424,874 as of December 31, 2017 and June 30, 2018, respectively. The Company used $20,817,798 cash in operations in 2017 and has used $9,753,922 for the six months ended June 30, 2018. The Company had cash and cash equivalents of $1,021,897 and $7,624,289 as of December 31, 2017 and June 30, 2018, respectively. Management expects operating losses and negative cash flows to continue for at least the next year as the Company continues to incur costs related to research and commercialization efforts. Management has prepared cash flow forecasts which indicate that based on the Company's expected operating losses and negative cash flows, there is substantial doubt about the Company's ability to continue as a going concern within twelve months after the date that the financial statements for the year ended December 31, 2017 and the six months ended June 30, 2018, are issued.

Further, on March 8, 2016, the Company entered into a new term Loan and Security Agreement with Western Alliance Bank (the "Western Alliance LSA"). The provisions of the Western Alliance LSA allow for Western Alliance Bank to exercise a material adverse effect clause should the Company incur a material adverse effect within the meaning provided by the Western Alliance LSA, which could include the going concern matters

described herein. Should Western Alliance Bank invoke the material adverse effect clause, the outstanding loan balance may be declared immediately due and payable. The Company believes that it is a remote probability that the material adverse effect clause associated with the Western Alliance LSA will be exercised.

Management's ability to continue as a going concern is dependent upon its ability to raise additional funding. Management has plans to raise additional capital through equity offerings or debt financings to fulfill its operating and capital requirements for at least 12 months and to maintain compliance with the Western Alliance LSA covenants (see Note 7). The Company's plans include continuing to fund its operating losses and capital funding needs through public or private equity or debt financings, strategic collaborations, licensing arrangements, asset sales, or other arrangements. However, the Company may not be able to secure such financing in a timely manner or on favorable terms, if at all. Furthermore, if the Company issues equity securities to raise additional funds, its existing stockholders may experience dilution, and the new equity securities may have rights, preferences and privileges senior to those of the Company's existing stockholders. If the Company raises additional funds through collaboration, licensing or other similar arrangements, it may be necessary to relinquish valuable rights to its products or proprietary technologies or grant licenses on terms that are not favorable to the Company.

On June 29, 2018, the Company entered into a new Credit and Security Agreement with MidCap Financial Trust (the "Midcap Agreement"). The Midcap Agreement resulted in a $10,000,000 term loan and a $1,000,000 Convertible note. Proceeds from the Midcap Agreement were used to repay the outstanding $7,000,000 balance on the Western Alliance LSA. The provisions of the Midcap Agreement allow for MidCap Financial Trust to exercise a material adverse effect clause should the Company incur a material adverse effect within the meaning provided by the Midcap Agreement, which could include the going concern matters described herein. Should MidCap Financial Trust invoke the material adverse effect clause, the outstanding loan balance may be declared immediately due and payable. The Company believes that it is a remote probability that the material adverse effect clause associated with the Midcap Agreement will be exercised. Management plans to continue raising capital through equity offerings and debt financings to fulfill its operating and capital requirements.

If the Company does not have or is not able to obtain sufficient funds, it may have to reduce commercialization efforts or delay its development of new products. The Company also may have to reduce marketing, customer support or other resources devoted to its products or cease operations.

2. Summary of Significant Accounting Policies

Use of Estimates

The financial statements are prepared in accordance with accounting principles generally accepted in the United States ("GAAP") and all intercompany transactions and balances have been eliminated in consolidation. The preparation of the Company's financial statements require the Company to make estimates and assumptions that impact the reported amounts of assets, liabilities and expenses and the disclosure of contingent assets and liabilities in the financial statements and accompanying notes. Management evaluates its estimates on an ongoing basis. Although estimates are based on the Company's historical experience, knowledge of current events and actions it may undertake in the future, actual results may ultimately materially differ from these estimates and assumptions.

Unaudited Interim Financial Information

The accompanying consolidated balance sheet as of June 30, 2018, the related consolidated statements of operations and consolidated statements of cash flows for the six months ended June 30, 2017 and 2018 and the consolidated statements of convertible preferred stock and stockholders' deficit for the six months ended June 30, 2018 are unaudited. The interim unaudited consolidated financial statements have been prepared on the same basis as the annual audited 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 June 30, 2018 and the results of its operations and its cash flows for the six months ended

June 30, 2017 and 2018. The financial data and other information disclosed in these notes related to the six months ended June 30, 2017 and 2018 are unaudited. The results for the six months ended June 30, 2018 are not necessarily indicative of results to be expected for the year ending December 31, 2018, any other interim periods or any future year or period.

Unaudited Pro Forma Balance Sheet Information

The unaudited pro forma consolidated balance sheet information as of June 30, 2018 assumes the conversion of all outstanding shares of convertible preferred stock into 2,850,280 shares of the Company's common stock and the resulting reclassification of the carrying value of the convertible preferred stock to stockholders' deficit upon the completion of the Company's proposed initial public offering (the "IPO"). The unaudited pro forma consolidated balance sheet information as of June 30, 2018 also assumes the conversion of all convertible notes into 3,018,312 shares of the Company's common stock and the resulting reclassification of the carrying value of the convertible notes to stockholders' deficit upon the completion of the Company's proposed IPO. Lastly, the unaudited pro forma consolidated balance sheet information as of June 30, 2018 assumes the cancellation of the warrant liability and the resulting reclassification of the carrying value of the warrant shares to stockholders' deficit upon the completion of the Company's IPO. The unaudited pro forma consolidated balance sheet assumes that the completion of the IPO had occurred as of June 30, 2018 and excludes shares of common stock issued in the IPO and any related net proceeds.

Reclassifications

Certain amounts presented in the prior year financial statements have been reclassified to conform to current year presentation. Product revenue has been separated into product revenue and other revenue and cost of revenue has been separated into cost of product revenue and cost of other revenue on the consolidated statements of operations. For the year ended December 31, 2016, $631,539 has been reclassified out of product revenue into other revenue and $118,921 has been reclassified out of cost of product revenue into cost of other revenue.

Cash and Cash Equivalents

The Company considers all highly liquid investments with an original maturity of three months or less at the date of purchase to be cash equivalents. Cash equivalents primarily represent funds invested in readily available checking and money market accounts.

The Company has not experienced any losses in such accounts. The Company believes that it is not exposed to any significant credit risk on cash and cash equivalents. Included in cash and cash equivalents is $201,623, $252,594 and $252,594 in restricted cash as of December 31, 2016 and 2017 and June 30, 2018, respectively, related to amounts held for leases and credit cards.

Fair Value of Financial Instruments

The carrying amounts of all cash equivalents, accounts receivable, prepaid expenses and other current assets, accounts payable and accrued liabilities are reasonable estimates of their fair value because of the short-term nature of these items. Company issued convertible preferred stock warrants are recorded at fair value on a recurring basis.

Concentration of Credit Risk

Financial instruments, which potentially subject the Company to significant concentration of credit risk, consist primarily of cash and cash equivalents and accounts receivable. The Company maintains deposits in federally insured major financial institutions in excess of federally insured limits. The Company has not experienced any losses in such accounts and management believes that the Company is not exposed to significant credit risk due to the financial position of the depository institution in which those deposits are held.

The Company's customers are located throughout the world. The Company generally does not require collateral from its customers, but it performs credit evaluations of their financial condition. More information on accounts receivable is contained in the paragraph titled "Accounts Receivable" below.

Accounts Receivable

The Company extends credit to its customers in the normal course of business based upon an evaluation of each customer's credit history, financial condition, and other factors. Estimates of allowances for doubtful accounts are determined by evaluating individual customer circumstances, historical payment patterns, length of time past due, and economic and other factors. Bad debt expense is recorded as necessary to maintain an appropriate level of allowance for doubtful accounts in selling, general and administrative expense.

The following table reflects the activity related to the Company's allowance for doubtful accounts:

	December 31,		June 30,
	2016	2017	2018 (unaudited)
Accounts receivable	$ 1,846,567	$ 3,614,214	$ 3,386,205
Provision	—	(262,000)	(500,000)
Accounts receivable, net	$ 1,846,567	$ 3,352,214	$ 2,886,205

For the years ended December 31, 2016 and 2017 and the six months ended June 30, 2017 and 2018, Ultravision Technology Ltd. represented 14%, 21%, 0% and 9%, BioStar Company represented 0%, 15%, 0% and 15%, Berry Genomics Corporation represented 11%, 2%, 0% and 1%, Star Research Technology LTD represented 12%, 0%, 1% and 0%, University of Oxford represented 20%, 0%, 0% and 6%, and University of Connecticut represented 12%, 0%, 0% and 0%, respectively, of the Company's accounts receivable balance.

Inventory

Inventory is stated at the lower of cost or net realizable value, on a first-in, first-out basis. Inventory includes raw materials and finished goods that may be used in the research and development process and such items are expensed as consumed or expired. Provisions for slow-moving, excess, and obsolete inventories are estimated based on product life cycles, historical experience, and usage forecasts.

The components of inventories are as follows:

	December 31,		June 30,
	2016	2017	2018 (unaudited)
Materials and supplies	$ 119,329	$ 203,085	$ 242,783
Finished Goods	1,678,072	1,490,657	1,730,155
	$ 1,797,401	$ 1,693,742	$ 1,972,938

Inventories are net of write-downs of approximately $0, $364,437 and $364,437 as of December 31, 2016 and 2017 and June 30, 2018, respectively. During the year ended December 31, 2017, in connection with the market launch of the Company's next generation product, the Saphyr system, the Company determined that its first generation Irys instruments on hand had net realizable values below carrying value. Accordingly, the Company recorded a charge of $364,437 included in cost of revenue to write-down these instruments to net realizable value. As of December 31, 2017, and June 30, 2018, the Company's finished goods inventory included approximately $1,287,000 of Irys instruments.

Property and Equipment

Property and equipment are recorded at cost and depreciated or amortized using the straight-line method over the estimated useful lives of the assets (generally three to five years, or the remaining term of the lease for leasehold improvements, whichever is shorter) and generally consist of laboratory equipment, computer and office equipment, furniture and fixtures, and leasehold improvements. Repairs and maintenance costs are charged to expense as incurred.

Long-Lived Assets

The Company regularly reviews the carrying value and estimated lives of all of its long-lived assets, including property and equipment, to determine whether indicators of impairment may exist which warrant adjustments to carrying values or estimated useful lives. Should an impairment exist, the impairment loss would be measured based on the excess over the carrying amount of the asset's fair value. The Company has not recognized any impairment losses from inception through December 31, 2016. During the year ended December 31, 2017, the Company recognized an impairment loss of $604,511 related to equipment at customer sites. No impairment losses were recognized during the six months ended June 30, 2017 and 2018.

Deferred Rent

Deferred rent consists of the difference between cash payments and the recognition of rent expense on a straight-line basis for the facilities the Company leases. The Company's leases for its facilities provide for fixed increases in minimum annual rental payments. The total amount of rental payments due over the lease terms are being charged to rent expense ratably over the life of the leases. The current portion of deferred rent is included in accrued expenses and the non-current portion in other non-current liabilities on the consolidated balance sheets.

Revenue Recognition

Product Revenue

Product revenue represents the sale of the Company's instruments and consumables to third parties. Timing of revenue recognition on instrument sales is based upon when delivery has occurred, the price is fixed or determinable, and collectability is reasonably assured.

The majority of our instruments contain embedded operating systems and other software which is included in the purchase price of the instrument. The software is deemed incidental to the system as a whole as it is not sold or marketed separately and its production costs are minor compared to those of the hardware system. Hardware and software elements are both delivered when ownership is transferred to the customer. Hardware upgrades, which are made available to customers for purchase, are recognized as revenue when delivered and all revenue recognition criteria noted above have been met.

Installation services for direct sale customers are performed at the same time or shortly after the product is delivered and require only a minimal effort to complete. We believe installation is a perfunctory service and is not material to our obligations in the contract.

Other Revenue

Other revenue includes revenue from extended service contracts and other services that may be performed. Revenue for extended warranty contracts is recognized ratably over the service period. Revenue for other services is generally recognized based on proportional performance of the contract, when the Company's ability to complete project requirements is reasonably assured. Deferred revenue represents amounts received in advance for on-going service arrangements. Most of these services are completed in a short period of time from the receipt of the customer's order. When significant risk exists in the Company's ability to fulfill project requirements, revenue is recognized upon completion of the contract.

Multiple Element Arrangements

The Company regularly enters into contracts where revenue is derived from multiple deliverables, including products or services. These contracts typically include an instrument, consumables, and extended service contracts. Revenue recognition for contracts with multiple deliverables is based on the individual units of accounting determined to exist in the contract. A delivered item is considered a separate unit of accounting when the delivered item has value to the customer on a stand-alone basis. Items are considered to have stand-alone value when they are sold separately by any vendor or when the customer could resell the item on a stand-alone basis.

For transactions with multiple deliverables, consideration is allocated at the inception of the contract to all deliverables based on their relative selling price. The relative selling price for each deliverable is determined using vendor-specific objective evidence ("VSOE") of selling price or third-party evidence of selling price if VSOE does not exist. If neither VSOE nor third-party evidence exists, the Company uses its best estimate of the selling price using average selling prices over an appropriate period coupled with an assessment of current market conditions. If the product or service has no history of sales or if the sales volume is not sufficient, the Company considers its approved standard prices adjusted for applicable discounts.

In order to establish VSOE of selling price, the Company must regularly sell the product or service on a standalone basis with a substantial majority priced within a relatively narrow range. In cases where there is not a sufficient number of standalone sales and VSOE of selling price cannot be determined, then the Company utilizes third-party evidence to establish selling price.

Distributor Transactions

In certain markets, the Company sells products and provides services to customers through distributors that specialize in life sciences products. In cases where the product is delivered to a distributor, revenue recognition generally occurs when title transfers to the distributor. The terms of sales transactions through distributors are generally consistent with the terms of direct sales to customers and do not contain return rights. Distributor sales transactions typically differ from direct customer sales as they do not require the Company's services to install the instrument at the end customer or perform the services for the customer that are beyond the standard warranty in the first year following the sale. These transactions are accounted for in accordance with the Company's revenue recognition policy described herein.

The Company derives a significant portion of product revenue from a limited distributor base. For the years ended December 31, 2016 and 2017, and the six months ended June 30, 2017 and 2018, Berry Genomics Corp. represented 15%, 4%, 8% and 6%, Ultravision Technology Ltd. represented 11%, 15%, 8% and 6%, Gene Company Ltd. represented 0%, 6%, 14% and 13%, and AS One Corp. represented 10%, 0%, 0% and 0%, respectively, of the Company's total revenues. No other distributor represented more than 10% of total Company revenues during these periods.

Cost of Revenue

Cost of revenue for products consists of the Company's instrument cost from the manufacturer, raw material parts costs and associated freight, shipping and handling costs, contract manufacturer costs, royalties due to third parties, salaries and other personnel costs, overhead and other direct costs related to those sales recognized as product revenue in the period.

Cost of other revenue consists of salaries and other personnel costs, and facility costs associated with costs related to warranties and other costs of servicing equipment at customer sites.

Research and Development Costs

Costs incurred for research and product development, including acquired technology and costs incurred for technology in the development stage, are expensed as incurred.

Patent Costs

Costs related to filing and pursuing patent applications are recorded as selling, general and administrative expense and expensed as incurred since recoverability of such expenditures is uncertain.

Deferred Offering Costs

Deferred public offering costs primarily consist of legal, accounting and filing fees relating to the IPO. The deferred offering costs will be offset against the IPO proceeds upon the consummation of the offering. In the event the offering is delayed or aborted, incurred offering costs will be expensed. The Company has incurred $1,436,320 of IPO costs as of June 30, 2018.

Stock-Based Compensation

Stock-based compensation expense represents the cost of the grant date fair value of employee stock option grants recognized over the requisite service period of the awards (usually the vesting period) on a straight-line basis, net of actual forfeitures during the period. The Company estimates the fair value of stock option grants using the Black-Scholes option pricing model. The exercise price for all stock options granted was at the estimated fair value of the underlying common stock as determined on the date of grant by the Board of Directors. The Board of Directors determined the value of the underlying stock by considering a number of factors, including historical and projected financial results, the risks the Company faced at the time, the preferences of the Company's convertible preferred stockholders, and the lack of liquidity of the Company's common stock.

Convertible Preferred Stock Warrants

The Company accounts for freestanding warrants to purchase shares of convertible preferred stock as liabilities in the balance sheets under preferred stock warrant liability. The convertible preferred stock warrants are subject to remeasurement at each reporting period, with changes in fair value recorded as change in fair value of warrants and expirations in the consolidated statements of operations.

Income Taxes

The Company accounts for income taxes under the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the financial statements. Under this method, deferred tax assets and liabilities are determined on the basis of the differences between the financial statements and tax basis of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to reverse. The effect of a change in tax rates on deferred tax assets and liabilities is recognized in income in the period that includes the enactment date.

The Company recognizes deferred tax assets to the extent that the Company believes these assets are more likely than not to be realized. In making such a determination, management considers all available positive and negative evidence, including future reversals of existing taxable temporary differences, projected future taxable income, tax-planning strategies, and results of recent operations. If management determines that the Company would be able to realize its deferred tax assets in the future in excess of their recorded amount, management would make an adjustment to the deferred tax asset valuation allowance, which would reduce the provision for income taxes.

As of December 31, 2016, and 2017, the Company maintained valuation allowances against its deferred tax assets as the Company concluded it had not met the "more likely than not" to be realized threshold. Changes in the valuation allowance when they are recognized in the provision for income taxes may result in a change in the estimated annual effective tax rate.

The Company recognizes the impact of uncertain tax positions at the largest amount that is "more likely than not" to be sustained upon audit by the relevant taxing authority. An uncertain tax position will not be recognized if it has less than a 50% likelihood of being sustained. The Company recognizes interest and penalties related to unrecognized tax benefits within income tax expense. Any accrued interest and penalties are included within the related tax liability.

Comprehensive Loss

Net loss and comprehensive loss were the same for all periods presented; therefore, a separate statement of comprehensive loss is not included in the financial statements.

Segment Reporting

Operating segments are identified as components of an enterprise about which separate discrete financial information is available for evaluation by the chief operating decision-maker in making decisions regarding resource allocation and assessing performance. The Company and its chief operating decision-maker, the Chief Executive Officer, views the Company's operations and manages its business in one operating segment.

The following table reflects total revenue by geography and as a percentage of total revenue, based on the billing address of the Company's customers. North America consists of the United States and Canada. EMEIA consists of Europe, the Middle East, India and Africa. Asia Pacific includes China, Japan, South Korea, Singapore and Australia.

	Year Ended December 31,				Six months ended June 30,			
	2016		2017		2017		2018	
	$	%	$	%	$	%	$	%
					(unaudited)			
North America	$2,078,987	31%	$3,801,481	40%	$1,794,728	47%	$2,553,428	49%
EMEIA	1,666,188	24%	1,282,897	13%	819,464	21%	1,128,510	21%
Asia Pacific	3,047,614	45%	4,420,665	47%	1,302,672	32%	1,476,556	30%
Total	$6,792,789	100%	$9,505,043	100%	$3,916,864	100%	$5,158,494	100%

Subsequent to the issuance of the June 30, 2018 unaudited condensed consolidated financial statements, the Company discovered an error in the disclosure of revenue amounts for the six months ended June 30, 2018 within the North America, EMEIA and Asia Pacific geographic regions. Accordingly, the table above has been restated to correct the June 30, 2018 disclosures of revenue for the North America, EMEIA, and Asia Pacific geographic regions, resulting in increases (decreases) from amounts previously reported of $837,451, $239,421, and $(1,076,872), respectively.

For the years ended December 31, 2016 and 2017, and the six months ended June 30, 2017 and 2018, the United States represented 30%, 37%, 46% and 50% and China represented 34%, 28%, 16% and 23%, respectively of total revenue.

Net Loss Per Share

Basic net loss per share is calculated by dividing the net loss by the weighted-average number of common shares outstanding for the period. Diluted net loss per share is computed by dividing the net loss by the weighted average number of common shares and common share equivalents outstanding for the period. Common stock equivalents are only included when their effect is dilutive. The Company's potentially dilutive securities which include convertible preferred stock and outstanding stock options under the Company's equity incentive plan have been excluded from the computation of diluted net loss per share as they would be anti-dilutive to the net loss per share. For all periods presented, there is no difference in the number of shares used to calculate basic and diluted shares outstanding due to the Company's net loss position.

Potentially dilutive securities not included in the calculation of diluted net loss per share attributable to common stockholders because to do so would be anti-dilutive are as follows (in common stock equivalent shares):

	Year Ended December 31,		Six months ended June 30,	
	2016	2017	2017	2018
			(unaudited)	
Series A convertible preferred stock	8,074	8,074	8,074	8,074
Series B convertible preferred stock	188,275	188,275	188,275	188,275
Series B-1 convertible preferred stock	80,327	80,327	80,327	80,327
Series C convertible preferred stock	545,728	545,728	545,728	545,728
Series D convertible preferred stock	482,529	482,529	482,529	482,529
Series D-1 convertible preferred stock	681,448	1,545,347	1,328,828	1,545,347
Common Stock Options	43,596	436,341	447,518	416,937
Preferred Warrants	856,921	855,212	856,921	869,814
Total	2,886,898	4,141,833	3,938,200	4,137,031

Unaudited Pro Forma Net Loss Per Share

	Year Ended December 31, 2017	Six months ended June 30, 2018
	(unaudited)	
Net loss and pro forma net loss attributable to common stockholders	$ (23,365,364)	$ (7,158,858)
Weighted-average common shares outstanding, basic and diluted	71,283	77,618
Add:		
Pro forma adjustments to reflect assumed conversion of convertible preferred stock	2,629,782	5,017,850
Pro forma weighted-average common shares outstanding, basic and diluted	2,701,065	5,095,468
Pro forma net loss per share attributable to common stockholders, basic and diluted	$ (8.65)	$ (1.40)

Recent Accounting Pronouncements

On April 5, 2012, President Obama signed the Jump-Start Our Business Startups Act (the "JOBS Act") into law. The JOBS Act contains provisions that, among other things, reduce certain reporting requirements for an emerging growth company. As an emerging growth company, the Company may elect to adopt new or revised accounting standards when they become effective for non-public companies, which typically is later than when public companies must adopt the standards. The Company has elected to take advantage of the extended transition period afforded by the JOBS Act and, as a result, will comply with new or revised accounting standards on the relevant dates on which adoption of such standards is required for emerging growth companies, which are the dates included below.

In May 2014, the FASB issued ASU 2014-09, *Revenue from Contracts with Customers (Topic 606)*. ASU 2014-09 completes the joint effort by the FASB and International Accounting Standards Board to improve financial reporting by creating common revenue recognition guidance for GAAP and International Financial Reporting Standards. ASU 2014-09 applies to all companies that enter into contracts with customers to transfer goods or services. Under the standard, revenue is recognized when a customer obtains control of promised goods or services in an amount that reflects the consideration the entity expects to receive in exchange for those goods or services. In addition, the standard requires disclosure of the nature, amount, timing, and uncertainty of revenue and cash flows arising from contracts with customers. The guidance permits two methods of adoption: retrospectively to each prior reporting period presented (full retrospective method), or retrospectively with the cumulative effect of initially applying the guidance recognized at the date of initial application (modified

retrospective method). The guidance is effective for reporting periods beginning after December 15, 2018, and interim periods beginning after December 15, 2019. The Company has evaluated this new guidance and does not expect the adoption to have a material impact on the financial statements.

In February 2015, the FASB issued ASU 2016-02, *Leases (Topic 842)*, which amends the FASB Accounting Standards Codification and creates Topic 842, "Leases." The new topic supersedes Topic 840, "Leases," and increases transparency and comparability among organizations by recognizing lease assets and lease liabilities on the balance sheet and requires disclosures of key information about leasing arrangements. The guidance is effective for reporting periods beginning after December 15, 2019, and interim periods within fiscal years beginning after December 15, 2020. ASU 2016-02 mandates a modified retrospective transition method. The Company is in the process of evaluating the impact of adoption of the ASU on the financial statements.

In January 2016, the FASB issued ASU No. 2016-01, *Financial Instruments—Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities (ASU 2016-01)*. This guidance changes how entities measure equity investments that do not result in consolidation and are not accounted for under the equity method. Entities will be required to measure these investments at fair value at the end of each reporting period and recognize changes in fair value in net income. A practicability exception will be available for equity investments that do not have readily determinable fair values, however; the exception requires the Company to consider relevant transactions that can be reasonably known to identify any observable price changes that would impact the fair value. This guidance also changes certain disclosure requirements and other aspects of current GAAP. This guidance is effective for the Company for the year ending December 31, 2019 and for interim periods effective the three months ending March 31, 2020. Early adoption is permitted. The Company is currently evaluating the requirements of ASU 2016-01 and has not yet determined whether the adoption of the standard will have a material impact on the financial statements.

In August 2016, the FASB issued ASU 2016-15, *Classification of Certain Cash Receipts and Cash Payments (Topic 230)*. ASU 2016-15 addresses eight specific cash flow issues with the objective of reducing the existing diversity in practice for certain cash receipts and cash payments. The standard is effective for annual reporting periods beginning after December 15, 2018 and interim periods reporting within fiscal years beginning after December 15, 2019, with early adoption permitted. The Company does not believe the adoption of this guidance will have a material impact on the financial statements.

3. Fair Value Measurements

The accounting guidance defines fair value, establishes a consistent framework for measuring fair value and expands disclosure for each major asset and liability category measured at fair value on either a recurring or nonrecurring basis. Fair value is defined as an exit price, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. As such, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset or liability. As a basis for considering such assumptions, the accounting guidance establishes a three-tier fair value hierarchy, which prioritizes the inputs used in measuring fair value as follows:

Level 1: Unadjusted quoted prices in active markets that are accessible at the measurement date for identical, unrestricted assets or liabilities.

Level 2: Quoted prices for similar assets and liabilities in active markets, quoted prices in markets that are not active, or inputs which are observable, either directly or indirectly, for substantially the full term of the asset or liability.

Level 3: Prices or valuation techniques that require inputs that are both significant to the fair value measurement and unobservable (i.e. supported by little or no market activity).

	December 31, 2016	Fair Value Measurement Using: Quoted Prices in Active Markets for Identical Assets Level 1	Significant Other Observable Inputs Level 2	Significant Unobservable Inputs Level 3
Assets				
Money market funds	$ 5,249,620	$ 5,249,620	$ —	$ —
Total assets	$ 5,249,620	$ 5,249,620	$ —	$ —
Liabilities				
Preferred stock warrant liability	$ 4,650,877	$ —	$ —	$ 4,650,877
Total liabilities	$ 4,650,877	$ —	$ —	$ 4,650,877

	December 31, 2017	Fair Value Measurements Using: Quoted Prices in Active Markets for Identical Assets Level 1	Significant Other Observable Inputs Level 2	Significant Unobservable Inputs Level 3
Assets				
Money market funds	$ 1,021,897	$ 1,021,897	$ —	$ —
Total assets	$ 1,021,897	$ 1,021,897	$ —	$ —
Liabilities				
Preferred stock warrant liability	$ 3,898,944	$ —	$ —	$ 3,898,944
Total liabilities	$ 3,898,944	$ —	$ —	$ 3,898,944

	June 30, 2018	Fair Value Measurements Using: Quoted Prices in Active Markets for Identical Assets Level 1	Significant Other Observable Inputs Level 2	Significant Unobservable Inputs Level 3
	(unaudited)			
Assets				
Money market funds	$7,624,289	$ 7,624,289	$ —	$ —
Total assets	$7,624,289	$ 7,624,289	$ —	$ —
Liabilities				
Preferred stock warrant liability	$1,604,836	$ —	$ —	$ 1,604,836
Total liabilities	$1,604,836	$ —	$ —	$ 1,604,836

The following table summarizes the changes in fair value of the Company's Level 3 liabilities for the years ended December 31, 2016 and 2017, and the six months ended June 30, 2018:

	Warrant Liability
Balance at January 1, 2016	$ 2,619,034
Issuance of warrants in connection with debt	99,684
Issuance of warrants in connection with equity	4,938,241
Expiration of Series C warrants	(1,113,633)
Change in fair value of preferred stock warrants	(1,892,449)
Balance at December 31, 2016	4,650,877
Expiration of Series A warrants	(1,424)
Change in fair value of preferred stock warrants	(750,509)
Balance at December 31, 2017	3,898,944
Issuance of warrants in connection with debt (unaudited)	176,813
Change in fair value of preferred stock warrants (unaudited)	$ (2,470,921)
Balance at June 30, 2018 (unaudited)	$ 1,604,836

As of December 31, 2013, the Company classified certain warrants to purchase Series A convertible preferred stock that contain down-round protection provisions as a liability. In connection with the Series C Convertible Participating Preferred Stock and Warrant Purchase Agreement in 2014, the composition of the Company's Board of Directors changed such that the holders of the Series A, B, B-1 and C convertible preferred stock controlled the Board of Directors. Accordingly, upon certain change in control events that are outside of the Company's control, including liquidation, sale, or transfer of control of the Company, holders of the convertible preferred stock can cause its redemption. As such, the then outstanding warrants to purchase shares of Series B and B-1 convertible preferred stock that were previously classified in equity at the time of the Series C Convertible Participating Preferred Stock and Warrant Purchase Agreement were reclassified to a liability at fair value. As of June 30, 2018, holders of the convertible preferred stock continue to control the Board of Directors.

The warrants to purchase shares of Series C convertible preferred stock issued in 2014 expired during the year ending December 31, 2016. In connection with the Series D Convertible Participating Preferred Stock and Warrant Purchase Agreement in 2016 (see Note 8), the Company issued warrants to purchase Series D convertible preferred stock which are classified as a liability. In connection with the Western Alliance LSA and subsequent amendment, the Company issued warrants to purchase Series D and D-1 convertible preferred stock which are classified as a liability (see Note 7).

The warrants to purchase convertible preferred stock are valued at each reporting period using the Black-Scholes-Merton model. This valuation includes observable inputs such as risk-free rate, as well as unobservable inputs for assumed volatility, the expected life of the warrants, and the fair value of the underlying convertible preferred stock. Quantitative information relating to unobservable inputs is disclosed below:

	December 31,		June 30,
	2016	2017	2018 (unaudited)
Risk-free interest rate	0.90%	1.75%	2.32%
Volatility	54.40%	54.60%	47.20%
Expected life (in years)	0.7-1.2	0.6	0.2
Dividend Yield	—	—	—
Fair value of Series A preferred stock	$ 0.67	$ 0.66	$ 0.49
Fair value of Series B-1 preferred stock	$ 0.37	$ 0.36	$ 0.36
Fair value of Series D preferred stock	$ 0.48	$ 0.48	$ 0.42
Fair value of Series D-1 preferred stock	$ 0.48	$ 0.48	$ 0.42

At December 31, 2016 and 2017, the fair value of the underlying convertible preferred stock was determined using an Option Pricing Method ("OPM"). Under the OPM, once the fair market value of the enterprise is established, shares are valued by creating a series of call options with exercise prices based on the liquidation preference and conversion behavior of the different classes of equity. Accordingly, the aggregate equity value is allocated to each of the classes of equity shares outstanding. At June 30, 2018, the fair value of the underlying convertible preferred stock was determined using a probability-weighted expected return model (the "PWERM") that incorporated two allocation methods: an initial public offering (the "IPO Scenario") and an OPM to project future outcomes of the Company should the Company remain private in the near term (the "Private Scenario"). In the PWERM IPO Scenario, the probability weighting was 50%, and in the Private Scenario, the probability weighting was 50%. The Company utilizes both the market and income approach to establish the fair market value of the enterprise.

Significant increases or decreases in any of these inputs in isolation (including those inputs utilized in the OPM or those in weighted the scenarios in the PWERM) would result in a significantly different fair value measurement. An increase in the risk-free interest rate, and/or an increase in the remaining contractual term or expected volatility, and/or an increase in the fair value of the convertible preferred stock would result in an increase in the fair value of the warrants.

During the year ended December 31, 2016, the Company modified the provisions of its outstanding Series A, B and C convertible preferred stock resulting in the shares outstanding being remeasured at fair value (see Note 8). The Company utilized the OPM to determine the value of each class of convertible preferred stock at the time of remeasurement.

4. Prepaid Expenses and Other Current Assets

Prepaid expenses and other current assets consist of the following:

	December 31,		June 30,
	2016	2017	2018 (unaudited)
Prepayment to supplier	$ 1,039,565	$ 492,330	$ 1,118,857
Deferred offering costs	—	—	1,436,320
Other current assets	802,501	579,182	615,046
Total	$ 1,842,066	$ 1,071,512	$ 3,170,223

5. Property and Equipment, net

Property and equipment, net consist of the following:

	December 31, 2016	December 31, 2017	June 30, 2018 (unaudited)
Computer and office equipment	$ 476,402	$ 476,402	$ 476,402
Lab equipment	3,252,020	3,995,731	4,156,519
Service equipment placed at customer sites	946,006	594,553	594,553
Leasehold improvements	1,795,178	1,860,667	1,860,667
	6,469,606	6,927,353	7,088,141
Less accumulated depreciation and amortization	(2,417,523)	(3,921,565)	(4,647,640)
	$ 4,052,083	$ 3,005,788	$ 2,440,501

The Company recorded depreciation and amortization expense of $1,115,027, $1,504,042, $724,381 and $778,555 for the years ended December 31, 2016 and 2017 and the six months ended June 30, 2017 and 2018, respectively in operating expenses.

6. Accrued Expenses

Accrued expenses consist of the following:

	December 31, 2016	December 31, 2017	June 30, 2018 (unaudited)
Accrued expenses	$ 2,246,071	$ 2,596,137	$ 3,032,139
Accrued offering costs	—	—	1,059,053
Accrued bonus	640,655	912,757	407,681
	$ 2,886,726	$ 3,508,894	$ 4,498,873

7. Long-Term Debt

Square 1 LSA

In 2012, the Company amended the Loan and Security Agreement with Square 1 Bank (the “Square 1 LSA”) for a $5,000,000 term loan in two tranches (Tranche I and Tranche II, up to $2,000,000 and $3,000,000, respectively) with interest at the prime rate plus 2.50%. The Company drew on Tranche I and Tranche II on June 24, 2013, and July 30, 2013, respectively, after which interest-only payments were due through December 11, 2014, as amended in August 2014, followed by principal payments of $277,778 plus interest per month due in 18 installments beginning in January 14, 2015. The Company began to make principal payments, as required, starting January 2015. In March 2016, the Company repaid the Square 1 LSA as part of entering into the Western Alliance LSA as discussed below.

Western Alliance LSA

On March 8, 2016, the Company entered into the Western Alliance LSA for $7,000,000. The loan proceeds were used to repay the outstanding $5,000,000 loan with Square 1 Bank, as required by the 12th amendment to the Square 1 LSA.

The Western Alliance LSA bears a floating interest rate at the 30-day LIBOR Rate plus 6.52% and will amortize in 30 equal monthly installments beginning on the amortization date described below. The Western

Alliance LSA is secured by substantially all assets of the Company and matures on April 1, 2020. The Western Alliance LSA is interest-only until July 8, 2018, which may be extended to October 8, 2018 if the Company is able to secure $21,000,000 in funding prior to June 30, 2018. The Company paid debt issuance costs and a facility fee totaling $113,542 at the inception of the loan, which was recorded as a debt discount and is being recognized as additional interest expense over the term of the loan. Subject to certain limited exceptions, amounts prepaid in relation to the Western Alliance LSA are subject to a prepayment fee based on the then outstanding balance equal to 3% in the first year, 2% in the second year, and 1% thereafter. In addition, upon repayment of the total amounts borrowed, the Company will be required to pay an end of term charge equal to 3.25% of the total amount borrowed. Accordingly, an end of term charge of $227,500 was recorded as debt discount and is included in other long-term liabilities on the balance sheet as of December 31, 2016 and under current liabilities as of December 31, 2017. The end of term charge is being recognized as additional interest expense over the term of the loan.

Additionally, in conjunction with the entry into Western Alliance LSA, the Company issued to Western Alliance Bank a warrant to purchase 510,417 shares of Series D convertible preferred stock at an exercise price of $0.48 per share that was immediately exercisable and expires March 8, 2026. The Company valued the warrant to purchase Series D convertible preferred stock using the Black-Scholes-Merton model, and the initial fair value of the warrant to purchase Series D convertible preferred stock of $65,384 was recorded as a debt discount and is being amortized to interest expense over the term of the loan. The assumptions used in the model were: the fair value of the Series D convertible preferred stock, which was determined using an OPM analysis (see Note 3), an expected life of 2 years, a risk-free interest rate of 0.88% and an expected volatility of 47%.

On December 9, 2016, the Western Alliance LSA was amended, requiring the Company to secure $5,000,000 in funding prior to April 30, 2017 and to secure $15,000,000 in funding between December 1, 2016 and October 8, 2017. In conjunction with this amendment, the Company issued to Western Alliance Bank a warrant to purchase 291,667 shares of Series D-1 convertible preferred stock that were immediately exercisable, expiring December 9, 2026. The Company valued the warrant to purchase Series D-1 convertible preferred stock using the Black-Scholes-Merton model, and the initial fair value of the warrant to purchase Series D-1 convertible preferred stock of $34,300 was recorded as a debt discount and is being amortized to interest expense over the term of the loan. The assumptions used in the model were: the fair value of the Series D-1 convertible preferred stock, which was determined using an OPM analysis (see Note 3), an expected life of 1.2 years, a risk-free interest rate of 0.85% and an expected volatility of 55%.

On November 20, 2017, the Western Alliance LSA was amended requiring the Company to secure $1,500,000 in funding prior to November 20, 2017 and to secure $15,000,000 in funding prior to December 31, 2017. In conjunction with this amendment, the Company agreed to pay an amendment fee of $17,500, which is payable on the earliest to occur of the loan maturity date or the prepayment date. The amount was recorded as a debt discount on the balance sheet and is being recognized as additional interest expense over the remaining term of the loan.

Under the terms of the amended Western Alliance LSA, the Company is subject to operational covenants, including limitations on the Company’s ability to incur liens or additional debt, pay dividends, and redeem stock, among other restrictions. The Company is subject to a performance to plan and minimum liquidity financial covenants. The performance to plan restriction requires that the Company’s actual trailing six-month revenues, as of any date of determination, shall be no less than seventy-five percent (75%) of projected revenues (the “Revenue Covenant”), as set forth in the Western Alliance LSA. However, the Company is not required to comply with the Revenue Covenant as long as the Company at all times maintains a ratio of its minimum unrestricted cash balance with Western Alliance Bank to its indebtedness with Western Alliance Bank of at least 0.75 to 1.00. As of December 31, 2016, and 2017, the Company was in compliance with its operational covenants.

The Company received a notice of default from Western Alliance Bank notifying the Company that it was in default as of December 31, 2017, as it had failed to secure at least $15,000,000 from the sale or issuance of its

equity securities or subordinated debt as set forth in the amended Western Alliance LSA. Based on the notice of default the Company reclassified the total loan balance of $6,729,752 to current liabilities on the consolidated balance sheet as of December 31, 2017, as the loan could be called at any time by Western Alliance Bank.

In February 2018, the Western Alliance LSA was amended requiring the Company to secure $21,000,000 in funding prior to June 30, 2018. As part of the amendment, Western Alliance Bank agreed to forbear from exercising any of its default remedies set forth in the Western Alliance LSA as a result of the Company's loan default.

On June 13, 2018, the Western Alliance LSA was amended, replacing previously amended funding requirements and requiring the Company to secure $5,000,000 in funding prior to August 3, 2018. Additionally, the amendment restricted Company use of all cash collected from customers, received on and after amendment date, until collecting a total of $2,500,000. As part of the amendment, Western Alliance Back waived the existing default.

MidCap Financial CSA

On June 29, 2018, the Company entered into a Credit and Security Agreement (CSA) with MidCap Financial Trust which provides a $15,000,000 term loan facility available in three tranches, Tranche 1: $10,000,000, Tranche 2: $2,500,000, and Tranche 3: $2,500,000. The Company borrowed $10,000,000 from Tranche 1 immediately upon closing the agreement; Tranches 2 and 3 are available to draw from after achieving $12,500,000 and $16,000,000 in trailing twelve month revenue, respectively. Proceeds from the loan were used to repay the outstanding $7,000,000 due to Western Alliance LSA.

The MidCap Financial CSA bears interest at an annual rate of one month LIBOR plus 7.5%, subject to a LIBOR floor of 1.5%. The loan has a 60-month term, with interest only for the first 18 months and straight-line amortization of principal and interest for the remaining 42 months. The interest only period will be extended by six months following successful completion of an initial public offering that generates not less than $30,000,000 of net proceeds. The CSA is secured by substantially all of the assets of the Company and matures on July 1, 2023.

The Company paid issuance fees of approximately $338,000 at the inception of the loan, which was recorded as a debt discount and is being recognized as additional interest expense over the term of the loan. Subject to certain limited exceptions, amounts prepaid in relation to the MidCap Financial CSA are subject to a prepayment fee determined by multiplying the amount being prepaid by 4% in the first year of the term, 3% in year two, and 2% thereafter. In addition, upon repayment of the total amounts borrowed, the Company will be required to pay an end of term charge equal to 4% of the total amount borrowed. Accordingly, an end of term charge of $400,000 was recorded as debt discount and is included in other long-term liabilities on the balance sheet as of June 30, 2018. The end of term charge is being recognized as additional interest expense over the term of the loan.

In conjunction with entering into the MidCap Financial CSA, the Company issued to MidCap a warrant to purchase 625,000 shares of Series D-1 convertible preferred stock at an exercise price of $0.48 per share that was immediately exercisable and expires June 29, 2028. The Company valued the warrant to purchase Series D convertible preferred stock using the Black-Scholes-Merton model, and the initial fair value of the warrant to purchase Series D-1 convertible preferred stock of $176,813 was recorded as a debt discount and is being amortized to interest expense over the term of the loan. The assumptions used in the model were: the fair value of the Series D-1 convertible preferred stock, which was determined using an OPM analysis (see Note 3), an expected life of 10 years, a risk-free interest rate of 2.83% and an expected volatility of 59%. In addition, MidCap invested $1,000,000 in the convertible note offering at terms identical to other investors described in the Convertible Notes section below.

Convertible Notes

On February 9, 2018, the Company entered into a Note Purchase Agreement (the "Note Purchase Agreement") with various investors, which included related parties (the "Investors"), pursuant to which the Company agreed to sell to the Investors convertible promissory notes (the "Convertible Notes") in the original principal amount of up to $15,960,000. On April 2, 2018, the Company amended the Note Purchase Agreement to, among other things, increase the principal amount available for issuance under the Note Purchase Agreement to $18,372,132. The Convertible Notes have a maturity date of September 30, 2018 and are convertible either into the Company's common stock or convertible preferred stock, dependent on the conversion events as described below.

On June 29, 2018, the Note Purchase Agreement was amended to increase the principal amount available for issuance from $18,372,132 to $19,372,132.

As of June 30, 2018, the Company received proceeds of approximately $14,400,000 from the issuance of the Convertible Notes.

Conversion and Liquidity Events

Conversion at Qualifying financing – Upon the closing of an equity financing following the date of the Note Purchase Agreement involving the sale by the Company of its convertible preferred stock in which the Company receives an aggregate of at least $15,000,000 in cumulative gross proceeds the conversion price will equal (i) for the Convertible Notes issued in February 2018, 75% of the lowest per share cash purchase price of the convertible preferred stock sold by the Company in such qualified financing and (ii) for the Convertible Note issued in June 2018, 80% of the lowest per share cash purchase price of the convertible preferred stock sold by the Company in such qualified financing. The original principal amount and accrued interest under each Convertible Note (the "Conversion Amount") shall automatically convert into convertible preferred stock.

Conversion at Initial Public Offering – Prior to the maturity date if the Company completes an IPO the Conversion Amount will automatically convert into shares of the Company's common stock at an amount equal to the Conversion Amount divided by (i) for the Convertible Notes issued in February 2018, 75% of either the per share cash purchase price of the common stock offered to the public in the IPO or the per unit cash purchase price of the units offered to the public in the IPO, as applicable, and (ii) for the Convertible Note issued in June 2018, 80% of either the per share cash purchase price of the common stock offered to the public in the IPO or the per unit cash purchase price of the units offered to the public in the IPO, as applicable.

Optional Conversion at Maturity – Upon maturity, and at the election of the Convertible Note holder, the Conversion Amount will convert into shares of Series D-2 convertible preferred stock as is equal to the Conversion Amount divided by the price per share. The price per share is defined as $60,000,000 divided by the aggregate number of outstanding shares of the Company's common stock as of the maturity date.

Liquidity Event – Upon a liquidation event or deemed liquidation event, the holders of the Convertible Notes will be entitled to receive repayment in an amount equal to (i) for the Convertible Notes issued in February 2018, 250% of the outstanding principal amount underlying the Convertible Notes and any unpaid interest accrued and outstanding and (ii) for the Convertible Note issued in June 2018, 200% of the outstanding principal amount underlying the Convertible Notes and any unpaid interest accrued and outstanding.

The Company evaluated the embedded conversion features within the above convertible notes under ASC 815-10 and ASC 815-15 to determine if they required bifurcation as a derivative instrument. The Company determined the embedded conversion features do not meet the definition of a derivative, and therefore, do not require bifurcation from the host instrument. Since the embedded conversion features were not considered derivatives, the convertible notes were accounted for accordance with ASC 470-20, Debt with Conversion and Other Options.

Debt and unamortized discount balances relating to the Western Alliance LSA are as follows:

	December 31, 2016	December 31, 2017	June 30, 2018 (unaudited)
Term loan face value	$7,000,000	$7,000,000	$ —
Fair value of warrant	(99,684)	(99,684)	
End of term charge	(227,500)	(227,500)	
Capitalized debt issuance costs	(113,542)	(131,042)	
Accretion of debt issuance costs and end of term charge	60,785	148,225	
Accretion of warrant fair value	13,117	39,753	
Balance	6,633,176	6,729,752	
Less current portion	587,131	6,729,752	
Long-term debt	$6,046,045	$ —	$ —

Debt and unamortized discount balances relating to the MidCap Financial CSA are as follows:

	June 30, 2018 (unaudited)
Term loan face value	$ 10,000,000
Fair value of warrant	(176,813)
End of term charge	(400,000)
Capitalized debt issuance costs	(467,044)
Accretion of debt issuance costs and end of term charge	—
Accretion of warrant fair value	—
Balance	8,956,143
Less current portion	—
Long-term debt	$ 8,956,143

Debt and unamortized discount balances relating to the convertible notes are as follows:

	June 30, 2018 (unaudited)
Convertible notes face value	$ 14,372,132
Capitalized debt issuance costs	(42,289)
Balance	14,329,843
Less current portion	14,329,843
Long-term debt	$ —

Non-cash interest expense related to debt discount amortization and accretion of end of term fees was $73,902, $96,576, $44,682 and $69,791 for the years ended December 31, 2016 and 2017 and six months ended June 30, 2017 and 2018, respectively.

Future minimum payments including interest under the loan and security agreement are as follows as of December 31, 2017:

Total minimum loan payments	$ 8,426,862
Unamortized interest	(1,199,362)
End of term charge	(227,500)
Warrant fair value	(59,931)
Capitalized debt issuance costs and end of term charge	(210,317)
Term loan	$ 6,729,752

Future minimum payments including interest under the MidCap Financial CSA are as follows as of June 30, 2018:

	(unaudited)
Years ending December 31,	
2018	$ 479,607
2019	959,213
2020	3,690,745
2021	3,416,684
2022-2023	5,011,160
Total minimum loan payments	$ 13,557,409
Unamortized interest	(3,157,409)
End of term charge	(400,000)
Warrant fair value	(176,813)
Capitalized debt issuance costs and end of term charge	(867,044)
Term loan	8,956,143
Less current portion	—
Long-term debt	$ 8,956,143

8. Convertible Preferred Stock and Stockholders' Deficit

Convertible Preferred Stock

The Company's convertible preferred stock has been classified as temporary equity on the accompanying balance sheets in accordance with authoritative guidance for the classification and measurement of redeemable securities. Upon certain change in control events that are outside of the Company's control, including liquidation, sale or transfer of control of the Company, holders of the convertible preferred stock can cause its redemption. There were 121,992,497 shares of convertible preferred stock outstanding as of December 31, 2017 and June 30, 2018, respectively.

The following sets forth information regarding all convertible preferred stock securities sold since January 1, 2016:

Series D Convertible Preferred Stock Financing

Between March 4, 2016 and April 4, 2016, the Company issued an aggregate of 20,652,486 shares of Series D convertible preferred stock at a purchase price of $0.48 per share, raising approximately $9,700,000, net of share issuance costs of $202,222, excluding the warrant liability discussed below. In conjunction with the Series D convertible preferred stock offering, the Company issued warrants to purchase an aggregate of 31,672,817 of

Series D convertible preferred stock. The Company determined that the warrants met the definition of freestanding financial instruments. Accordingly, the fair value of the warrants was recognized as a liability with an offsetting net deduction to convertible preferred stock. The Company valued the Series D convertible preferred stock warrants using the Black-Scholes-Merton model, and the initial fair value was determined to be $4,938,241. The assumptions used in the model included the fair value of the Series D convertible preferred stock of $0.48, an expected life of 1.9 to 2 years, a risk-free interest rate of 0.74% to 0.88% and an expected volatility of 47%.

Series D-1 Convertible Preferred Stock Financing

Between August 5, 2016 and August 29,2016, the Company issued an aggregate of 29,166,671 shares of Series D-1 convertible preferred stock at $0.48 per share, raising approximately $13,800,000, net of share issuance costs of $200,002.

From February through November 2017, the Company sold and issued 36,974,586 shares of Series D-1 convertible preferred stock at $0.48 per share, raising approximately $17,590,000, net of issuance costs of $154,191. At any time after December 31, 2021, the holders of a majority of the then outstanding Series D-1 convertible preferred stock may redeem any unconverted or unredeemed Series D-1 convertible preferred stock in cash at the greater of the original convertible preferred stock purchase price plus all declared but unpaid dividends or the fair market value. The Company has determined not to adjust the carrying values of the Series D-1 convertible preferred stock to the liquidation preferences of such shares because of the uncertainty over whether or when such an event would occur. The Company has determined that it is not probable that such redemption will occur as a mandatory conversion event, as described below, is expected in advance of the redemption triggers.

Convertible Preferred Stock

The Series A, B, B-1, C, D and D-1 convertible preferred stock (collectively, the “Series Preferred”) have the following rights and privileges:

Voting rights

Series Preferred stockholders are entitled to cast the number of votes equal to the number of whole shares of common stock into which the convertible preferred stock is convertible.

Conversion

Each 42.8 shares of Series Preferred is convertible, at any time, into one share of common stock at the then-applicable Conversion Price (as defined below). The Series Preferred is automatically converted into common stock, at the then-applicable Conversion Price, upon (a) the vote or consent of 66-2/3% of the outstanding shares of Series Preferred or (b) upon the closing of the sale to the public of either shares of common stock or units comprised of shares of common stock and warrants to purchase shares of common stock (i) in which the price per share paid by the public (prior to the deduction of underwriting discounts and registration expenses) is no less than $6.00 per share, or to the extent units are sold in such offering, no less than $6.00 per unit (in each case as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to shares of common stock effectuated after August 15, 2018), in each case in the initial closing of the such offering, and (ii) resulting in at least $15,000,000 in gross proceeds to the company (prior to the deduction of underwriting discounts and registration expenses), in a firm-commitment underwritten public offering pursuant to an effective registration statement under the Securities Act of 1933, as amended. The Conversion Price was initially $1.3995 for each share of Series A, B and B-1 convertible preferred stock, $1.4043 for each share of Series C convertible preferred stock and $0.48 for each share of Series D and D-1 convertible preferred stock. The Conversion Price is subject to adjustment in certain circumstances.

Dividends

Holders of the Series Preferred are entitled to receive cash dividends at the rate of 8% of the applicable Original Issue Price (as defined below) per annum, on a non-cumulative basis, on each outstanding share of Series Preferred. The Company shall not declare any dividends on any shares of Series Preferred other than shares of Series D-1 convertible preferred stock unless the holders of the Series D-1 convertible preferred stock then outstanding first receive, or simultaneously receive, full payment of a dividend. The Original Issue Price is $2.733 per share for the Series A convertible preferred stock, $1.3995 per share for the Series B convertible preferred stock, $1.3995 per share for the Series B-1 convertible preferred stock, $1.4043 per share for the Series C convertible preferred stock, $0.48 per share for the Series D convertible preferred stock and $0.48 per share for the Series D-1 convertible preferred stock, each subject to adjustment in the event of any reorganization, stock split, recapitalization or other similar event involving or affecting a change in the Company's capital structure.

Liquidation Preferences

In the event of liquidation or winding up of the Company, (i) the holders of the Series D and D-1 convertible preferred stock, on a pari passu basis, shall be entitled to receive, prior to and in preference to any payment or distribution to the holders of, Series C convertible preferred stock, Series B and B-1 convertible preferred stock, Series A convertible preferred stock and common stock, a per-share amount equal to the applicable Liquidation Preference (as defined below); (ii) the holders of the Series C convertible preferred stock, on a pari passu basis, shall be entitled to receive, prior to and in preference to any payment or distribution to the holders of Series B and B-1 convertible preferred stock, Series A convertible preferred stock, and common stock, a per-share amount equal to the applicable Liquidation Preference; and (iii) the holders of Series B and B-1 convertible preferred stock and the holders of Series A convertible preferred stock, on a pari passu basis, shall be entitled to receive, prior to and in preference to any payment or distribution to the holders of common stock, a per-share amount equal to the applicable Liquidation Preference. The Liquidation Preference is calculated as follows: (i) when the Company is valued at $91 million or below, the Liquidation Preference is equal to the applicable Original Issue Price for such shares plus the amount of any declared but unpaid dividends and (ii) when the company is valued greater than $91 million, the Liquidation Preference is equal to the applicable Original Issue Price for such shares plus the amount of any declared but unpaid dividends, with the first $10 million of proceeds above $91 million distributed to the holders of the Series D and D-1 convertible preferred stock on a pro rata basis ((i) and (ii) together, "Liquidation Preference").

The authorized shares, purchase price, outstanding shares and Liquidation Preference for each series of convertible preferred stock as of December 31, 2017 and June 30, 2018 (unaudited), are as follows:

	Shares Authorized (December 31, 2017)	Shares Authorized (June 30, 2018)	Purchase Price Per Share	Shares Outstanding	Liquidation Preference
Convertible preferred stock:					
Series A	418,767	418,767	$ 1.39950	345,587	$ 483,649
Series B	8,101,042	8,101,042	$ 1.39950	8,058,170	$ 11,277,409
Series B-1	7,523,734	7,523,734	$ 1.39950	3,437,950	$ 4,811,411
Series C	23,357,047	23,357,047	$ 1.40430	23,357,047	$ 32,800,301
Series D	52,835,720	52,835,720	$ 0.48000	20,652,486	$ 9,913,193
Series D-1	125,808,667	126,746,167	$ 0.48000	66,141,257	$ 31,747,803
Total	218,044,977	218,982,477		121,992,497	$ 91,033,766

Series A, B and C Convertible Preferred Stock Modification

On March 6, 2016 (the "Series A-C Modification Date"), the Company notified existing holders of Series A, B, B-1 and C convertible preferred stock that they would be required to participate in the Series D convertible

preferred stock financing at a specified pro rata amount (which equated to their existing applicable ownership percentage of the company).

As of the Series A-C Modification Date, the conversion ratio of Series A, B, B-1 and C convertible preferred stock was adjusted from 1:1 to 1:10 (i.e., 1 share of convertible preferred stock was convertible to 10 shares of common stock) for holders of the Series A, B, B-1 and C convertible preferred stock that elected to participate in the second issuance of the Series D convertible preferred stock financing at or above their pro rata amounts. If the holders of Series A, B, B-1 and C convertible preferred stock did not participate at or above their pro rata amounts, any existing shares of Series A, B, B-1 and C convertible preferred stock were automatically and mandatorily converted into common stock on a 1:1 basis (which represented the existing conversion ratio in effect prior to such modification). Such an automatic conversion would result in the loss of all rights and privileges associated with being a holder of convertible preferred stock (i.e. liquidation preference, board representation and dividend rights).

If the holders of Series A, B, B-1 and C convertible preferred stock elected to participate in the Series D convertible preferred stock financing in excess of their pro rata amount, any additional investment would result in the issuance of warrants to purchase Series D convertible preferred stock. The effective price of the warrants to purchase Series D convertible preferred stock at the date of issuance was a 15% discount from the selling price of the Series D convertible preferred stock.

The Company follows the qualitative approach to assessing changes in terms of convertible preferred stock. Based on its qualitative assessment, the Company determined that the revision of the terms of the Series A, B, B-1 and C convertible preferred stock resulted in both the extinguishment of the Series A, B, B-1 and C convertible preferred stock and the reissuance of the Series A, B, B-1 and C convertible preferred stock. Accordingly, the Company concluded that the difference between the fair value of the post-modification Series A, B, B-1 and C convertible preferred stock and the carrying value of the pre-modification Series A, B, B-1 and C convertible preferred stock should be recognized as an adjustment recorded through accumulated deficit.

The impact of the special mandatory conversion of convertible preferred stock to common stock, as well as the fair value adjustment is as follows:

	Pre-Modification		Post Modification	
	Book Value	Outstanding Shares	Fair Value	Outstanding Shares
Series A preferred stock	$ 4,989,018	1,908,757	$ 61,847	345,587
Series B preferred stock	23,909,095	17,195,333	842,845	8,058,170
Series B-1 preferred stock	10,359,042	7,441,559	359,593	3,437,950
Series C preferred stock	48,930,547	37,752,481	5,547,841	23,357,047
	$ 88,187,702	64,298,130	$ 6,812,126	35,198,754

On August 4, 2016, in connection with the Reverse Stock Split (as defined below), the conversion ratio of the existing Series A, B, B-1 and C convertible preferred stock was adjusted back to 1:1 (i.e., 1 share of convertible preferred stock was convertible to 1 share of common stock).

Warrants

On July 3, 2012, in conjunction with the Square 1 LSA, the Company issued a warrant to purchase 64,309 shares of Series B-1 convertible preferred stock to Square 1 Bank at an exercise price of $1.3995 per-share. The warrant expires in July 2019.

On December 11, 2013, in conjunction with an amendment to the Square 1 LSA, the Company issued a warrant to purchase 10,718 shares of Series B-1 convertible preferred stock to Square 1 Bank at an exercise price of $1.3995 per-share. The warrant expires in December 2020.

On September 17, 2013, in conjunction with the subordinated convertible promissory notes that were issued in connection with the September 2013 Note and Warrant Purchase Agreement, the Company issued warrants to purchase 1,480,988 shares of Series B-1 convertible preferred stock. Per the terms of the September 2013 Note and Warrant Purchase Agreement, the number of shares of Series B-1 convertible preferred stock purchasable under these warrants was increased to 2,123,528 shares as the Company did not complete a qualified financing prior to January 1, 2014. The warrants allow the investors to purchase Series B-1 convertible preferred stock at an exercise price of $1.3995 per-share. The warrants expire in 2023.

On June 12, 2014, in conjunction with the subordinated convertible promissory notes that were issued in connection with the June 2014 Note and Warrant Purchase Agreement, the Company issued warrants to purchase 715,766 shares of Series B-1 convertible preferred stock at an exercise price of $1.3995 per- share. The warrants expire in 2024.

On September 9, 2014 and November 11, 2014, in conjunction with the issuance of Series C convertible preferred stock, the Company issued warrants to purchase 4,450,616 shares and 6,527,568 shares of Series C convertible preferred stock, respectively, at an exercise price of $1.4043 per-share. On March 31, 2016, all warrants to purchase Series C convertible preferred stock issued in conjunction with the Series C convertible preferred stock offering expired under the terms of their issue with no investor electing to exercise their warrants. As such, these warrants have been retired by the Company.

On March 4, 2016, in conjunction with the Series D convertible preferred stock offering, the Company issued warrants to purchase 31,672,817 shares of Series D convertible preferred stock at an exercise price of $0.41 per-share. The warrants expire in 2026.

On March 8, 2016, in conjunction with the Western Alliance LSA, the Company issued a warrant to purchase 510,417 shares of Series D convertible preferred stock to Western Alliance Bank at an exercise price of $0.48 per-share. Additionally, in conjunction with the first amendment to the Western Alliance LSA, on December 9 2016, the Company issued a warrant to purchase 291,667 shares of Series D-1 convertible preferred stock to Western Alliance Bank at an exercise price of $0.48 per-share. Both of these warrants expire in 2026.

On June 29, 2018, in conjunction with the MidCap Financial CSA, the Company issued a warrant to purchase 625,000 shares of Series D-1 convertible preferred stock to MidCap Financial at an exercise price of $0.48 per-share. This warrant expires in 2028.

All the outstanding warrants to purchase convertible preferred stock are classified as liabilities in the financial statements and are valued at each reporting period using the Black-Scholes-Merton model as discussed in Note 3, “Fair Value Measurements”.

Common Stock

On August 4, 2016, the Company filed a Certificate of Amendment of the Company’s Certificate of Incorporation with the Secretary of State of the State of Delaware to effect a reverse split of common stock at a ratio of one-for-ten, which became effective at the close of business on that day (the “Reverse Stock Split”). As a result, each share of the Company’s common stock outstanding as of August 4, 2016 was automatically changed into one-tenth of a share of common stock, which resulted in a reduction of 1,411,180 shares of common stock issued and outstanding. No fractional shares were issued in connection with the Reverse Stock Split and cash paid to stockholders for potential fractional shares was insignificant. The authorized number of shares and the par value per share of the Company’s common stock were not affected by the Reverse Stock Split.

During 2016, the Company issued 338 shares of common stock in connection with the exercise of stock options, for net proceeds of $1,961.

During 2017, the Company issued 7,079 shares of common stock in connection with the exercise of stock options, for net proceeds of $14,265.

During the six months ended June 30, 2018, the Company issued 788 shares of common stock in connection with the exercise of stock options, for net proceeds of $1,012.

Stock Options

The Company's Amended and Restated 2006 Equity Compensation Plan, as amended (the "Plan"), is to provide designated employees of the Company, its subsidiaries, consultants, advisors and non-employee members of the Board with the opportunity to receive grants of incentive stock options and nonqualified stock options. The Company believes that the Plan will encourage the participants to contribute materially to the growth of the Company, thereby benefiting the Company's stockholders, and will align the economic interests of the participants with those of the stockholders. As of December 31, 2016, and 2017, and June 30, 2018, the number of shares reserved under the Plan was 511,194.

There were 464,803, 57,904 and 83,597 shares available for grant under the Plan as of December 31, 2016 and 2017, and June 30, 2018, respectively. Options granted under the Plan are exercisable at various dates as determined upon grant and will expire no more than ten years from the date of grant, or in the case of certain non-statutory options, exactly ten years from the date of grant. The exercise price of each option shall be determined by the Board of Directors although generally options have an exercise price equal to the fair market value of the Company's stock on the date of the option grant. In the case of incentive stock options, the exercise price shall not be less than 100% of the fair market value of the Company's common stock at the time the option is granted. For holders of more than 10% of the Company's total combined voting power of all classes of stock, incentive stock options may not be granted at less than 110% of the fair market value of the Company's stock at the date of grant and for a term not to exceed five years. Most option grants generally vest 25% on the first anniversary of the original vesting commencement date, with the balance vesting monthly in equal installments over the remaining three years.

A summary of the Company's stock option activity under the Plan is as follows:

	Shares	Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Term	Aggregate Intrinsic Value
Outstanding at December 31, 2016	43,596	$ 42.80	8.0	$ —
Granted	461,978	1.28		—
Exercised	(7,077)	2.14		$ 80,959
Cancelled	(62,156)	3.42		—
Outstanding at December 31, 2017	436,341	$ 5.14	9.0	$ —
Granted (unaudited)	385	1.28		—
Exercised (unaudited)	(788)	1.28		$ 1,012
Cancelled/Expired (unaudited)	(19,001)	6.44		—
Outstanding at June 30, 2018 (unaudited)	416,937	$ 4.99	8.5	$ —
Vested and expected to vest at December 31, 2016	39,003	$ 46.22	7.5	$ —
Vested and exercisable at December 31, 2016	19,421	$ 62.92	5.9	$ —
Vested and expected to vest at December 31, 2017	460,458	$ 5.56	9.0	$ —
Vested and exercisable at December 31, 2017	193,425	$ 8.56	8.8	$ —
Vested and expected to vest at June 30, 2018 (unaudited)	395,986	$ 3.27	8.5	$ —
Vested and exercisable at June 30, 2018 (unaudited)	237,804	$ 7.17	8.5	$ —

For the six months ended June 30, 2018, the Company granted to its employee's options to purchase 385 shares of its common stock with an exercise price of $1.28 per share.

From February through May 2017, the Company granted to its employee's options to purchase 404,937 shares of its common stock with an exercise price of $1.28 per share.

For the years ended December 31, 2016 and 2017, the total grant date fair value of vested options was $246,378 and $365,154, respectively. The weighted-average grant date fair value of employee option grants during the years ended December 31, 2016 and 2017 was $1.28.

For the six months ended June 30, 2017 and 2018, the total grant date fair value of vested options was $169,021 and $111,942, respectively. The weighted-average grant date fair value of employee option grants during the six months ended June 30, 2017 and 2018 was $1.28.

Stock-Based Compensation Expense

The Company recognized stock-based compensation expense of $130,643, $382,830, $217,846 and $107,426 for the years ended December 31, 2016 and 2017 and the six months ended June 30, 2017 and 2018, respectively.

The weighted-average assumptions used in the Black-Scholes option pricing model to determine the fair value of the employee stock option grants were as follows:

	Year Ended December 31,		Six months ended June 30,	
	2016	2017	2017	2018
			(unaudited)	
Risk-free interest rate	1.1 - 1.4%	1.8 - 2.0%	1.9%	2.5%
Expected volatility	77 - 83%	58 - 67%	59%	63%
Expected term (in years)	5.3 - 5.4	5.1 - 5.3	5.1	4.0
Expected dividend yield	0%	0%	0%	0%

Risk-free interest rate. The risk-free rate assumption is based on the U.S. Treasury instruments, the terms of which were consistent with the expected term of the Company's stock options.

Expected volatility. Due to the Company's limited operating history and lack of company-specific historical or implied volatility as a private company, the expected volatility assumption was determined by examining the historical volatilities of a group of industry peers whose share prices are publicly available.

Expected term. The expected term of stock options represents the weighted-average period the stock options are expected to be outstanding. The Company uses the simplified method for estimating the expected term as provided by the Securities and Exchange Commission. The simplified method calculates the expected term as the average of the time-to-vesting and the contractual life of the options.

Expected dividend yield. The expected dividend assumption is based on the Company's history and expectation of dividend payouts. The Company has not paid and does not intend to pay dividends.

Forfeitures. The Company reduces stock-based compensation expense for actual forfeitures during the period.

As of December 31, 2016 and 2017 and June 30, 2018, the unrecognized compensation cost related to outstanding employee options was $393,213, $282,642 and $179,526, respectively, and is expected to be recognized as expense over approximately 2.6 years, 1.6 years and 1.2 years, respectively.

Common Stock Reserved for Future Issuance

Common stock reserved for future issuance consist of the following:

	Year Ended December 31,		Six Months Ended June 30, 2018
	2016	2017	(unaudited)
Convertible preferred stock	1,986,377	2,850,276	2,850,280
Stock options issued and outstanding	43,596	436,341	416,937
Authorized for future stock awards or option grants	464,803	57,904	83,597
Preferred warrants	856,921	855,212	869,814
Total	3,351,697	4,199,733	4,220,628

9. Commitments and Contingencies

Leases

The Company leases certain office and lab space in San Diego, California under a non-cancelable operating lease, which was amended July 1, 2015 to add laboratory space and office space and extend its terms through December 2020. Rent expense was $495,475, $590,089, $295,044, and $295,044 for the years ended December 31, 2016 and 2017 and six months ended June 30, 2017 and 2018, respectively, including the offset for amortization of the leasehold incentive obligation of $150,035, $225,052, $112,526 and $112,526 for the years ended December 31, 2016 and 2017 and the six months ended June 30, 2017 and 2018, respectively.

The future minimum lease payments required under non-cancelable leases as of December 31, 2017, are summarized as follows:

Year Ending December 31,	
2018	$ 826,884
2019	862,656
2020	902,412
Total minimum lease payments	$ 2,591,952

Royalty Agreements

The Company has entered into agreements to market and distribute chips and kits used in its instruments. Pursuant to these agreements, the Company is obligated to pay royalties based on sales during each annual license period and is obligated to make minimum payments regardless of the level of sales achieved. The Company has paid $221,688, $233,128, $116,466 and $166,483 for the years ended December 31, 2016 and 2017 and the six months ended June 30, 2017 and 2018, respectively.

Such royalty agreements extend through the life of underlying intellectual property which is affected by patent filing date and jurisdiction. As of December 31, 2017, annual future minimum royalty payments under the Company’s royalty agreements total $70,000, on a continuing basis, and extend through November 29, 2026.

Purchase Commitments

The Company has a contractual commitment with a supplier to purchase $100,000 of products each quarter until the first quarter of 2019. The Company is not able to determine the aggregate amount of other such purchase orders that represent contractual obligations, as purchase orders may represent authorizations to

purchase rather than binding agreements. The Company's purchase orders are based on its current procurement or development needs and are fulfilled by the Company's vendors within short time horizons.

Litigation

The Company is subject to potential liabilities under various claims and legal actions that are pending or may be asserted. These matters arise in the ordinary course and conduct of the business. The Company intends to continue to defend itself vigorously in such matters. The Company regularly assesses contingencies to determine the degree of probability and range of possible loss for potential accrual in the financial statements. An estimated loss contingency is accrued in the financial statements if it is probable that a liability has been incurred and the amount of the loss can be reasonably estimated. Based on the Company's assessment, it currently does not have any amount accrued as it is not a defendant in any claims or legal actions.

10. Income Taxes

	December 31,	
	2016	2017
Deferred tax assets:		
Net operating loss carryforwards	$ 39,333,135	$ 30,528,420
Research and development credits	3,057,595	4,078,522
Other	884,910	1,163,659
Total gross	43,275,640	35,770,601
Valuation allowance	(43,275,640)	(35,770,601)
Net deferred tax assets	$ —	$ —

The provision for domestic and foreign income taxes is as follows:

	Years Ended December 31,	
	2016	2017
Current:		
Foreign	$ 12,060	$ 16,996
State and local	864	1,556
Income tax provision	$ 12,924	$ 18,552

The domestic and foreign components of income (loss) from continuing operations are as follows:

	Years Ended December 31,	
	2016	2017
Domestic	$ (18,892,417)	$ (23,455,215)
Foreign	56,726	108,403
Loss before provision for income taxes	$ (18,835,691)	$ (23,346,812)

A reconciliation of the income tax computed at the federal statutory tax rate to the expense for income taxes for the years ended December 31, 2016 and 2017 is as follows:

	December 31,	
	2016	2017
Tax at statutory rate	$ (6,404,287)	$ (7,939,075)
State income taxes, net of federal benefits	(195,417)	(376,232)
Change in valuation allowance	7,278,255	(7,523,665)
Tax Cuts and Jobs Act	—	16,552,989
Other permanent differences	394,784	542,487
Credits	(1,060,411)	(1,237,952)
Income tax expense	$ 12,924	$ 18,552

On December 22, 2017, the President of the United States signed into law the Tax Cuts and Jobs Act (the “Act”). The Act amends the Internal Revenue Code to reduce tax rates and modify policies, credits, and deductions for individuals and businesses. For businesses, the Act reduces the corporate tax rate from a maximum of 35% to a flat 21% rate. The rate reduction is effective on January 1, 2018. The Company has calculated its best estimate of the impact of the Act and as a result of the rate reduction, the Company has recorded a reduction to the deferred tax asset balance as of December 31, 2017 by $16.6 million, offset by a full valuation allowance. The Company has reduced its valuation allowance by $7.5 million due to the full valuation allowance position. The reduction in the valuation allowance includes the revaluation of the deferred tax assets, current year losses, and other timing items.

On December 22, 2017, Staff Accounting Bulletin No. 118 (“SAB 118”) was issued to address the application of GAAP in situations when a registrant does not have the necessary information available, prepared, or analyzed (including computations) in reasonable detail to complete the accounting for certain income tax effects of the Act. In accordance with SAB 118, the Company’s provisional determination is that there is no deferred tax benefit or expense with respect to the remeasurement of certain deferred tax assets and liabilities due to the full valuation allowance against net deferred tax assets. Additional analysis of the law and the impact to the Company will be performed and any impact will be recorded in the respective quarter in 2018. The Company did not record any adjustments to this provisional amount during the six months ended June 30, 2018 and will continue to analyze and refine its calculations related to the remeasurement as the impact of the Act is finalized.

As of December 31, 2017, the Company has federal and state tax net operating loss carryforwards of $128.3 million and $51.0 million, respectively. The federal and state tax loss carryforwards begin to expire in 2027 and 2031, respectively, unless previously utilized. The Company also has federal and California research credit carryforwards of $4.0 million and $3.6 million, respectively. The federal research credit carryforwards and state credit carryforwards begin to expire in 2027 unless previously utilized. The California research credits carry forward indefinitely.

Management assesses all available evidence to estimate if sufficient future taxable income will be generated to use the existing deferred tax assets. The Company has experienced net losses since inception, and the revenue and income potential of the Company’s business and market are unproven. Due to the Company’s continuing research and development activities, the Company expects to continue to incur net losses into the foreseeable future. As such, the Company cannot conclude that it is more likely than not that its deferred tax assets will be realized. A valuation allowance of $43.3 million and $35.8 million as of December 31, 2016 and 2017, respectively, has been established to offset the deferred tax assets, as realization of such assets is uncertain.

Utilization of the net operating losses and research and development (“R&D”) credit carryforwards are subject to annual limitations due to ownership change limitations that have occurred or that could occur in the future, as required by Section 382 of the Internal Revenue Code of 1986, as amended (the “Code”), as well as

similar state and foreign provisions. These ownership changes may limit the amount of net operating losses and R&D credit carryforwards that can be utilized annually to offset future taxable income and tax, respectively. In general, an "ownership change" as defined by Section 382 of the Code results from a transaction or series of transactions over a three-year period resulting in an ownership change of more than 50 percentage points of the outstanding stock of a company by certain stockholders.

During 2013, the Company completed a Section 382/383 analysis, from inception through December 31, 2012, regarding the limitation of the net operating losses and R&D credits. Based upon the analysis, the Company determined that no ownership changes occurred during that period. However, there may have been ownership changes subsequent to December 31, 2012, that could limit the Company's ability to utilize the net operating loss and R&D credit carryforwards. The Company plans to complete an analysis prior to using any of the net operating losses and R&D credits.

The Company is subject to taxation in the United States and the United Kingdom. The Company's tax years from 2007 (inception) are subject to examination by the United States and state authorities due to the carry forward of unutilized net operating losses and R&D credits.

A reconciliation of the beginning and ending amount of unrecognized tax benefits for 2016 and 2017, excluding interest and penalties, is as follows:

	December 31,	
	2016	2017
Balance at beginning of the year	$ 1,903,164	$ 2,451,121
Additions/(reductions) for tax positions - prior year	34,365	—
Increase related to prior year positions - current year	513,592	567,442
Increase related to current year positions	—	—
Balance at the end of the year	$ 2,451,121	$ 3,018,563

The Company recognizes the impact of uncertain tax positions at the largest amount that is "more likely than not" to be sustained upon audit by the relevant taxing authority. An uncertain tax position will not be recognized if it has less than a 50% likelihood of being sustained. Due to the valuation allowance position, none of the unrecognized tax benefits, if recognized, will impact the Company's effective tax rate. The Company does not anticipate a significant change in the unrecognized tax benefits during the next twelve months.

11. Employee Benefits

The Company has a defined contribution 401(k) plan available to eligible employees. Under the terms of the plan, employees may make voluntary contributions as a percent of compensation, limited to the maximum amount allowable under federal tax regulations. The Company, at its discretion, may make certain contributions to the 401(k) plan. The Company made matching contributions of $408,675 and $395,360, and, $237,574 and $133,165, for the years ended December 31, 2016 and 2017 and the six months ended June 30, 2017 and 2018, respectively.

12. Subsequent Events

For the purposes of the financial statements as of December 31, 2017 and the year then ended, the Company identified subsequent events through May 11, 2018, the date on which the financial statements were issued, and, with respect to the reverse stock split transactions described below, through July 16, 2018 and August 15, 2018.

For the purposes of the financial statements as of June 30, 2018 and the six months then ended, the Company has evaluated subsequent events through July 13, 2018, the date on which the financial statements were issued, and, with respect to the reverse stock split transactions described below, through July 16, 2018 and August 15, 2018.

Reverse Stock Splits

On July 16, 2018, the Company effected a one-for-21.4 reverse stock split of its issued and outstanding shares of common stock and a proportional adjustment to the existing conversion ratios for each series of the Company's redeemable convertible preferred stock, and on August 15, 2018, the Company effected an additional one-for-2 reverse stock split of its issued and outstanding shares of common stock and a proportional adjustment to the existing conversion ratios for each series of the Company's redeemable convertible preferred stock (see Note 8). Accordingly, all share and per share amounts for all periods presented in the accompanying financial statements and notes thereto have been adjusted retroactively, where applicable, to reflect these reverse stock splits and adjustments of the preferred stock conversion ratios.

2,450,000 Units

Sole Book-Running Manager

Roth Capital Partners

Lead Manager

Maxim Group LLC

Co-Manager

LifeSci Capital LLC

Through and including , 2018 (the 25th day after the date of this prospectus), all dealers that effect transactions in these securities, whether or not participating in this offering, may be required to deliver a prospectus. This is in addition to a dealer's obligation to deliver a prospectus when acting as an underwriter and with respect to an unsold allotment or subscription.

PART II

INFORMATION NOT REQUIRED IN PROSPECTUS

Unless otherwise indicated, all references to “Bionano,” the “company,” “we,” “our,” “us” or similar terms refer to Bionano Genomics, Inc. and its subsidiaries.

Item 13. Other Expenses of Issuance and Distribution.

The following table sets forth all expenses to be paid by us, other than underwriting discounts and commissions, in connection with this offering. All amounts shown are estimates except for the SEC registration fee, the FINRA filing fee and the exchange listing fee.

SEC registration fee	$ 4,912
FINRA filing fee	5,763
Exchange listing fee	50,000
Printing and engraving expenses	60,000
Legal fees and expenses	1,005,000
Accounting fees and expenses	800,000
Custodian transfer agent and registrar fees	25,000
Miscellaneous expenses	27,575
Total	$ 1,978,250

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 Bionano Genomics, 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 Bionano Genomics, Inc.

At present, there is no pending litigation or proceeding involving a director or officer of Bionano Genomics, 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 Securities Exchange Act of 1934, as amended, that might be incurred by any director or officer in his capacity as such.

The underwriters are obligated, under certain circumstances, under the underwriting agreement to be filed as Exhibit 1.1 to this Registration Statement, to indemnify us and our officers and directors against liabilities under the Securities Act.

Item 15. Recent Sales of Unregistered Securities.

The following sets forth information regarding all unregistered securities sold since January 1, 2015:

(1) In February 2016, we issued convertible promissory notes in the aggregate principal amount of $1.5 million with an interest rate of 8% per annum. These notes converted into an aggregate of 3,138,013 shares of our Series D convertible preferred stock in March 2016, as described in paragraph (2) below.

(2) In March 2016, we sold and issued an aggregate of 16,224,422 shares of our Series D convertible preferred stock and warrants to purchase an aggregate of 20,941,734 shares of our Series D convertible preferred stock to accredited investors in the first closing of our Series D financing. In this closing, we sold and issued an aggregate of 16,224,422 shares of our Series D convertible preferred stock at a purchase price of $0.48 per share for gross proceeds of approximately $7.8 million, which included the conversion of an aggregate of approximately $1.5 million in principal and accrued interest outstanding under the subordinated convertible promissory notes described in paragraph (1) above into an aggregate of 3,138,013 shares of our Series D convertible preferred stock at a conversion price equal to the purchase price in the financing. The warrants to purchase our Series D convertible preferred stock were sold and issued at a purchase price of $0.001 per share for an aggregate purchase price of approximately $20,941.

(3) In March 2016, we issued a warrant to purchase an aggregate of 510,417 shares of our Series D convertible preferred stock to Western Alliance Bank in connection with the entry into our Loan and Security Agreement with Western Alliance Bank.

(4) In April 2016, we held a second closing of our Series D financing, pursuant to which we sold and issued 4,428,064 shares of our Series D convertible preferred stock to accredited investors at a purchase price of $0.48 per share, for gross proceeds of approximately $2.1 million, and warrants to purchase 10,731,083 shares of our Series D convertible preferred stock at a purchase price of $0.001 per share for an aggregate purchase price of approximately $10,731.

(5) In August 2016, we sold and issued an aggregate of 2,083,335 shares of our Series D-1 convertible preferred stock to accredited investors in the first closing of our Series D-1 financing, at a purchase price of $0.48 per share, for gross proceeds of approximately $1.0 million.

(6) In August 2016, we held a second closing of our Series D-1 financing, pursuant to which we sold and issued 20,833,336 shares of our Series D-1 convertible preferred stock to accredited investors, at a purchase price of $0.48 per share, for gross proceeds of approximately $10.0 million.

(7) In August 2016, we held a third closing of our Series D-1 financing, pursuant to which we sold and issued 6,250,000 shares of our Series D-1 convertible preferred stock to accredited investors, at a purchase price of $0.48 per share, for gross proceeds of approximately $3.0 million.

(8) In December 2016, we issued a warrant to purchase 291,667 shares of our Series D-1 convertible preferred stock to Western Alliance Bank in connection with an amendment to our loan facility with Western Alliance Bank.

(9) In February 2017, we held a fourth closing of our Series D-1 financing, pursuant to which we sold and issued 10,416,667 shares of our Series D-1 convertible preferred stock to accredited investors, at a purchase price of $0.48 per share, for gross proceeds of approximately $5.0 million.

(10) In March 2017, we held a fifth closing of our Series D-1 financing, pursuant to which we sold and issued 2,083,334 shares of our Series D-1 convertible preferred stock to accredited investors, at a purchase price of $0.48 per share, for gross proceeds of approximately $1.0 million.

(11) In March 2017, we held a sixth closing of our Series D-1 financing, pursuant to which we sold and issued 2,083,334 shares of our Series D-1 convertible preferred stock to accredited investors, at a purchase price of $0.48 per share, for gross proceeds of approximately $1.0 million.

(12) In April 2017, we held a seventh closing of our Series D-1 financing, pursuant to which we sold and issued 1,041,667 shares of our Series D-1 convertible preferred stock to accredited investors, at a purchase price of $0.48 per share, for gross proceeds of approximately $0.5 million.

(13) In May 2017, we held an eighth closing of our Series D-1 financing, pursuant to which we sold and issued 1,145,834 shares of our Series D-1 convertible preferred stock to accredited investors, at a purchase price of $0.48 per share, for gross proceeds of approximately $0.6 million.

(14) In May 2017, we held a ninth closing of our Series D-1 financing, pursuant to which we sold and issued 2,083,334 shares of our Series D-1 convertible preferred stock to accredited investors, at a purchase price of $0.48 per share, for gross proceeds of approximately $1.0 million.

(15) In July 2017, we held a tenth closing of our Series D-1 financing, pursuant to which we sold and issued 8,745,417 shares of our Series D-1 convertible preferred stock to accredited investors, at a purchase price of $0.48 per share, for gross proceeds of approximately $4.2 million.

(16) In August 2017, we held an eleventh closing of our Series D-1 financing, pursuant to which we sold and issued 6,250,000 shares of our Series D-1 convertible preferred stock to accredited investors, at a purchase price of $0.48 per share, for gross proceeds of approximately $3.0 million.

(17) In November 2017, we held a twelfth closing of our Series D-1 financing, pursuant to which we sold and issued 3,125,000 shares of our Series D-1 convertible preferred stock to accredited investors, at a purchase price of $0.48 per share, for gross proceeds of approximately $1.5 million.

(18) In February 2018, we issued convertible promissory notes in the aggregate principal amount of approximately $13.4 million with an interest rate of 8% per annum. In connection with the completion of our initial public offering, the principal amount of the convertible promissory notes and accrued interest thereon will automatically convert into 3,018,312 shares of our common stock, assuming an initial public offering price of $6.50 per unit and a conversion date of June 30, 2018.

(19) From January 1, 2015 through April 30, 2018, we granted to our directors, employees, consultants and other service providers options to purchase 491,275 shares of our common stock with per share exercise prices ranging from $1.28 to $64.20 under our Amended and Restated 2006 Equity Compensation Plan, as amended.

(20) In June 2018, we issued a convertible promissory note in for an aggregate principal amount of $1,000,000 with an interest rate of 8% to Midcap Financial Trust with an interest rate of 8% per annum. In connection with the completion of our initial public offering, the principal amount of the convertible promissory note and accrued interest thereon will automatically convert into 192,349 shares of our common stock, assuming an initial public offering price of $6.50 per unit and a conversion date of June 30, 2018.

(21) In June 2018, we issued a warrant to purchase an aggregate of 625,000 shares of our Series D-1 convertible preferred stock to Midcap Financial Trust in connection with the entry into our Credit and Security Agreement with MidCap Financial Trust.

None of the foregoing transactions involved any underwriters, underwriting discounts or commissions, or our public offering. Unless otherwise specified above, we believes these transactions were 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 under 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.

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Item 16. Exhibits and Financial Statement Schedules.

(a) Exhibits.

Exhibit Number	Description
1.1	Form of Underwriting Agreement.
3.1	Eighth Amended and Restated Certificate of Incorporation, as amended.
3.2#	Form of Amended and Restated Certificate of Incorporation, to be in effect upon the closing of the offering.
3.3#	Bylaws, as amended.
3.4#	Form of Amended and Restated Bylaws, to be in effect upon the closing of the offering.
4.1#	Form of Common Stock Certificate.
4.2#	Warrant to Purchase Series B Preferred Stock issued to Square 1 Bank.
4.3#	Warrant to Purchase Series B-1 Preferred Stock issued to Square 1 Bank.
4.4#	Form of Warrant to Purchase Series B-1 Preferred Stock issued to investors.
4.5#	Warrant to Purchase Series D Preferred Stock issued to Western Alliance Bank.
4.6#	Form of Warrant to Purchase Series D Preferred Stock issued to investors.
4.7#	Warrant to Purchase Series D-1 Preferred Stock issued to Western Alliance Bank.
4.8#	Warrant to Purchase Series D-1 Preferred Stock issued to Midcap Financial Trust.
4.9	Form of Warrant to Purchase Common Stock issued to underwriters (included in Exhibit 1.1).
4.10	Form of Warrant Certificate (included in Exhibit 4.11).
4.11	Form of Warrant Agent Agreement by and between the Registrant and American Stock Transfer & Trust Company LLC, as warrant agent.
4.12	Form of Unit Certificate.
5.1	Opinion of Cooley LLP.
10.1	Fifth Amended and Restated Investors' Rights Agreement, dated August 5, 2016 as amended.
10.2#	Bionano Genomics, Inc. Amended and Restated 2006 Equity Compensation Plan (the "2006 Plan").
10.3#	Forms of grant notice, stock option agreement and notice of exercise under the 2006 Plan.
10.4	Bionano Genomics, Inc. 2018 Equity Incentive Plan (the "2018 Plan").
10.5#	Forms of grant notice, stock option agreement and notice of exercise under the 2018 Plan.
10.6	Bionano Genomics, Inc. 2018 Employee Stock Purchase Plan.
10.7#	Form of Indemnification Agreement by and between the Registrant and each director and executive officer.
10.8#	Bionano Genomics, Inc. Non-Employee Director Compensation Policy.
10.9#	Credit and Security Agreement by and between the Registrant, Midcap Financial Trust and the Lenders listed on the Schedule of Lenders attached thereto, dated June 29, 2018.
10.10#	Employment Agreement by and between the Registrant and R. Erik Holmlin, Ph.D., dated November 7, 2017, as amended.
10.11#	Employment Agreement by and between the Registrant and Han Cao, Ph.D., dated November 7, 2017, as amended.
10.12#	Employment Agreement by and between the Registrant and Mike Ward, dated July 1, 2016.
10.13#	Employment Agreement by and between the Registrant and Warren Robinson, dated November 7, 2017.
10.14#	Employment Agreement by and between the Registrant and Mark Borodkin, dated November 7, 2017.

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Exhibit Number	Description
10.15#	Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated March 8, 2016.
10.16#	First Amendment to the Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated December 9, 2016.
10.17#	Second Amendment to the Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated May 2, 2017.
10.18#	Third Amendment to the Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated November 20, 2017.
10.19#	Forbearance and Fourth Amendment to the Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated February 9, 2018.
10.20#	Lease by and between the Registrant and The Irvine Company LLC, dated January 16, 2012.
10.21#	First Amendment to the Lease by and between the Registrant and The Irvine Company LLC, dated September 10, 2013.
10.22#	Second Amendment to the Lease by and between the Registrant and The Irvine Company LLC, dated July 1, 2015.
10.23*#	Master Services Agreement by and between the Registrant and Skorpios Technologies, Inc. (f/k/a Novati Technologies, Inc. and f/k/a SVTC Technologies, LLC), dated March 2, 2009, as amended.
10.24*#	Manufacturing Services Agreement by and between the Registrant and Paramit Corporation, dated February 18, 2015.
10.25*#	License Agreement by and between Princeton University and the Registrant, dated January 7, 2004.
10.26*#	First Amendment to the License Agreement by and between Princeton University and the Registrant, dated December 17, 2004.
10.27*#	Second Amendment to the License Agreement by and between Princeton University and the Registrant, dated February 25, 2010.
10.28#	Third Amendment to the License Agreement by and between Princeton University and the Registrant, dated October 17, 2011.
10.29*#	Fourth Amendment License Agreement by and between Princeton University and the Registrant, dated February 9, 2012.
10.30*#	Agreement by and between the Registrant and Berry Genomics Co., Ltd. dated August 2, 2016.
10.31*#	Sublicense Agreement by and between the Registrant and Industry 3200 dated December 27, 2013.
10.32*#	License Agreement by and between the Registrant and Q Biotechnology CV dated May 1, 2014.
10.33*#	Amendment to Non-Exclusive Patent License Agreement by and between the Registrant and Q Biotechnology CV dated May 1, 2014.
10.34*#	License Agreement by and between the Registrant and New York University dated November 4, 2013.
10.35*#	Option and Sublicense Agreement by and between the Registrant and Pacific Biosciences of California, Inc. dated February 2, 2016.
10.36#	Note Purchase Agreement by and among the Registrant and the Investors listed on Exhibit A thereto, dated February 9, 2018.
10.37#	First Amendment to Note Purchase Agreement by and among the Registrant and the Investors listed on the Schedule of Investors attached thereto, dated April 2, 2018.

Exhibit Number	Description
10.38#	Fifth Amendment to Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated June 13, 2018.
10.39*#	Amendment to Patent Sublicense Agreement by and between the Registrant and Industry 3200, dated June 28, 2018.
10.40#	Second Amendment to Note Purchase Agreement by and between the Registrant and the Investors listed on the Schedule of Investors attached thereto, dated June 29, 2018.
10.41#	Omnibus Amendment to Convertible Promissory Notes by and among the Registrant and the Holders identified in the signature pages thereto, dated June 29, 2018.
10.42	Omnibus Amendment to Convertible Promissory Notes by and among the Registrant and the Holders identified in the signature pages thereto, dated August 14, 2018.
10.43	Omnibus Amendment to Warrants to Purchase Series B-1 Preferred Stock by and among the Registrant and the Holders identified in the signature pages thereto, dated August 14, 2018.
10.44	Omnibus Amendment to Warrants to Purchase Series D Preferred Stock by and among the Registrant and the Holders identified in the signature pages thereto, dated August 14, 2018.
21.1#	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. Reference is made to the signature page of the registration statement filed by the Registrant on June 28, 2018.
24.2#	Power of Attorney. Reference is made to the signature page of the registration statement filed by the Registrant on July 13, 2018.

* Confidential treatment has been requested with respect to certain portions of this exhibit. Omitted portions have been filed separately with the SEC.
\# Previously filed.

(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 financial statements or the notes thereto.

Item 17. Undertakings.

(a) 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.

(b) Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the registrant under the foregoing provisions, or otherwise, the registrant has been advised that in the opinion of the SEC 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.

(c) The undersigned registrant hereby undertakes that:

(1) For purposes of determining any liability under the Securities Act, the information omitted from the form of prospectus filed as part of this registration statement in reliance on Rule 430A and contained in a form of prospectus filed by the registrant under Rule 424(b)(1) or (4) or 497(h) under the Securities Act will 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, as amended, each post-effective amendment that contains a form of prospectus will be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time will be deemed to be the initial bona fide offering thereof.

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SIGNATURES

Pursuant to the requirements of the Securities Act, the Registrant has duly caused this Amendment No. 5 to the Registration Statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of San Diego, State of California, on the 15th day of August, 2018.

BIONANO GENOMICS, INC.

By: /s/ R. Erik Holmlin, Ph.D.
R. Erik Holmlin, Ph.D.
President and Chief Executive Officer

Pursuant to the requirements of the Securities Act, this Amendment No. 5 to the Registration Statement has been signed by the following persons in the capacities and on the dates indicated.

Signature	Title	Date
/s/ R. Erik Holmlin, Ph.D. R. Erik Holmlin, Ph.D.	Chief Executive Officer and Director *(Principal Executive Officer)*	August 15, 2018
/s/ Mike Ward Mike Ward	Chief Financial Officer *(Principal Financial and Accounting Officer)*	August 15, 2018
/s/ David L. Barker, Ph.D.* David L. Barker, Ph.D.	Director	August 15, 2018
/s/ Darren Cai, Ph.D.* Darren Cai, Ph.D.	Director	August 15, 2018
/s/ Albert A. Luderer, Ph.D.* Albert A. Luderer, Ph.D.	Director	August 15, 2018
/s/ Junfeng Wang* Junfeng Wang	Director	August 15, 2018
/s/ Christopher Twomey* Christopher Twomey	Director	August 15, 2018
/s/ Quan Zhou* Quan Zhou	Director	August 15, 2018

* Pursuant to power of attorney

By: /s/ R. Erik Holmlin, Ph.D.
R. Erik Holmlin, Ph.D.
Attorney-in-Fact

Exhibit 1.1

BIONANO GENOMICS, INC.

UNDERWRITING AGREEMENT

[ ] Units

, 2018

Roth Capital Partners, LLC
888 San Clemente Drive, Suite 400
Newport Beach, CA 92660

As the Representative of the
Several Underwriters Named on Schedule I Hereto

Ladies and Gentlemen:

Bionano Genomics, Inc., a Delaware corporation (the "Company"), proposes, subject to the terms and conditions stated herein, to issue and sell to the underwriters named in Schedule I hereto (the "Underwriters," or each, an "Underwriter"), for whom Roth Capital Partners, LLC is acting as representative (the "Representative"), an aggregate of [ ] units (each a "Unit" and collectively, the "Units"), each consisting of one share of the Company's common stock (the "Common Stock"), par value $0.0001 per share (the "Firm Shares") and one warrant (each a "Firm Warrant" and collectively, the "Firm Warrants") to purchase one share of Common Stock (collectively, the "Firm Units"). The Common Stock that is issuable upon the exercise of either the Firm Warrants or the Option Warrants (as defined below) to be issued in this offering shall be referred to herein as the "Warrant Shares." The Company also proposes to grant to the Underwriters, upon the terms and conditions set forth in Section 4 hereof, an option (the "Over-Allotment Option") to purchase, in the aggregate, [ ] Units (the "Option Units"), each Option Unit consisting of one share of Common Stock (the "Option Shares" and, together with the Firm Shares, the "Shares"), and one Warrant to purchase one share of Common Stock (the "Option Warrants" and, together with the Firm Warrants, the "Warrants"), at a purchase price per share equal to the public offering price, for the sole purpose of covering over-allotments in connection with the sale of the Firm Units. The Firm Shares and the Firm Warrants, as well as the Common Stock issuable upon exercise of the Firm Warrants, are hereinafter referred to as the "Firm Securities." The Option Shares and the Option Warrants, as well as the Common Stock issuable upon exercise of the Option Warrants, are hereinafter referred to as the "Option Securities." The Firm Securities and the Option Securities are collectively referred to as the "Public Securities." For the purpose of this Agreement, the term "Separation Date" shall mean the earlier of (i) the 30th day after the Effective Date or (ii) such earlier date as may be specified in a notice provided by the Representative to the Company.

The Company and the several Underwriters hereby confirm their agreement as follows:

1. Registration Statement and Prospectus.

The Company has prepared and filed with the Securities and Exchange Commission (the "Commission") a registration statement covering the Public Securities on Form S-1 (File No. 333-225970) under the Securities Act of 1933, as amended (the "Securities Act"), and the rules and regulations (the "Rules and Regulations") of the Commission thereunder, including a preliminary prospectus relating to the Public Securities and such amendments to such registration statement (including post-effective amendments) as may have been required to the date of this Underwriting Agreement (this "Agreement"). Such registration statement, as amended (including any post-effective amendments), has been declared effective by the Commission. Such registration statement, including amendments thereto (including post-effective amendments thereto), at the time of effectiveness thereof (the "Effective Time"), the exhibits and any schedules thereto at the Effective Time or thereafter during the period of effectiveness and the documents and information otherwise deemed to be a part thereof or included therein by the Securities Act or otherwise pursuant to the Rules and Regulations at the Effective Time or thereafter during the period of effectiveness, is herein called the "Registration Statement." If the Company has filed or files an abbreviated registration statement pursuant to Rule 462(b) under the Securities Act (the "Rule 462 Registration Statement"), then any reference herein to the term Registration Statement shall include such Rule 462 Registration Statement. Any preliminary prospectus included in the Registration Statement or filed with the Commission pursuant to Rule 424(a) under the Securities Act is hereinafter called a "Preliminary Prospectus." The Preliminary Prospectus relating to the Public Securities that was included in the Registration Statement immediately prior to the pricing of the offering contemplated hereby is hereinafter called the "Pricing Prospectus."

The Company is filing with the Commission pursuant to Rule 424 under the Securities Act a final prospectus covering the Public Securities, which includes the information permitted to be omitted therefrom at the Effective Time by Rule 430A under the Securities Act. Such final prospectus, as so filed, is hereinafter called the "Final Prospectus." The Final Prospectus, the Pricing Prospectus and any Preliminary Prospectus in the form in which they were included in the Registration Statement or filed with the Commission pursuant to Rule 424 under the Securities Act is hereinafter called a "Prospectus."

The Commission has not notified the Company of any objection to the use of the form of Registration Statement or any post-effective amendment thereto.

2. Representations and Warranties of the Company Regarding the Offering.

(a) The Company represents and warrants to, and agrees with, the several Underwriters, as of the date hereof, as of the Closing Date (as defined in Section 4(d) below) and as of each Option Closing Date (as defined in Section 4(b) below), if any, as follows:

(i) **No Material Misstatements or Omissions**. At the Effective Time, at the date hereof, at the Closing Date, and at each Option Closing Date, if any, the Registration Statement and any post-effective amendment, at the time of filing thereof, conformed in all material respects with the requirements of the Securities Act and the Rules and Regulations and did not contain 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. The Time of Sale Disclosure Package (as defined in Section 2(a)(v)(A)(1) below), as of [●] (Eastern time) on the

date hereof (the "Applicable Time"), on the Closing Date, if any, and on each Option Closing Date, if any, and the Final Prospectus, as amended or supplemented, as of its date, at the time of filing pursuant to Rule 424(b) under the Securities Act, at the Closing Date, and at each Option Closing Date, if any, and any individual Written Testing-the-Waters Communication (as defined in Section 2(a)(iv) below), when considered together with the Time of Sale Disclosure Package, did not contain 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, in the light of the circumstances under which they were made, not misleading. The representations and warranties set forth in the two immediately preceding sentences shall not apply to statements in or omissions from the Registration Statement, the Time of Sale Disclosure Package, or any Prospectus in reliance upon, and in conformity with, the written information furnished by any Underwriters' Information (as defined below). No order preventing or suspending the effectiveness or use of the Registration Statement or any Prospectus is in effect and no proceedings for such purpose have been instituted or are pending, or, to the knowledge of the Company, are contemplated or threatened by the Commission.

(ii) **Marketing Materials**. The Company has not distributed any prospectus or other offering material in connection with the offering and sale of the Public Securities other than the Time of Sale Disclosure Package and the roadshow or investor presentations delivered to and approved by the Representative for use in connection with the marketing of the offering of the Public Securities (the "Marketing Materials").

(iii) **Emerging Growth Company**. The Company is an "emerging growth company," as defined in Section 2(a) of the Securities Act (an "Emerging Growth Company").

(iv) **Testing-the-Waters Communications**. The Company (i) has not alone engaged in any Testing-the-Waters Communication (as defined below), other than Testing-the-Waters Communications with the written consent of the Representative, and (ii) has not authorized anyone other than the Underwriters to engage in Testing-the-Waters Communications. The Company confirms that the Underwriters have been authorized to act on its behalf in undertaking Testing-the-Waters Communications. The Company has not distributed any Testing-the-Waters Communication that is a written communication within the meaning of Rule 405 under the Securities Act ("Written Testing-the-Waters Communications"). "Testing-the-Waters Communication" means any oral or written communication with potential investors undertaken in reliance on Section 5(d) of the Securities Act. The Company has filed publicly on the Electronic Data Gathering, Analysis, and Retrieval system (EDGAR), at least 15 calendar days prior to any "road show" (as defined in Rule 433 und the Securities Act), any confidentially submitted registration statement and registration statement amendments relating to the offer and sale of the Public Securities. Each Written Testing-the-Waters Communication, did not, as of the Applicable Time, and at all times through the completion of the public offer and sale of the Public Securities will not, include any information that conflicted or conflicts with the information contained in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus.

(v) **Accurate Disclosure**. (A) The Company has provided a copy to the Underwriters of each Issuer Free Writing Prospectus (as defined below) used in the sale of

the Public Securities. The Company has filed all Issuer Free Writing Prospectuses required to be so filed with the Commission, and no order preventing or suspending the effectiveness or use of any Issuer Free Writing Prospectus is in effect and no proceedings for such purpose have been instituted or are pending, or, to the knowledge of the Company, are contemplated or threatened by the Commission. When taken together with the rest of the Time of Sale Disclosure Package or the Final Prospectus, no Issuer Free Writing Prospectus, as of the Closing Date and as of each Option Closing Date, does or will include (1) any untrue statement of a material fact or omission to state any material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading, or (2) information that conflicted with the information contained in the Registration Statement or the Final Prospectus. The representations and warranties set forth in the immediately preceding sentence shall not apply to statements in or omissions from the Time of Sale Disclosure Package, the Final Prospectus or any Issuer Free Writing Prospectus in reliance upon, and in conformity with, the Underwriters' Information (as defined below). As used in this paragraph and elsewhere in this Agreement:

(1) "Time of Sale Disclosure Package" means the Prospectus most recently filed with the Commission before the time of this Agreement, including any preliminary prospectus supplement deemed to be a part thereof, each Issuer Free Writing Prospectus, and the description of the transaction provided by the Underwriters included on Schedule II hereto.

(2) "Issuer Free Writing Prospectus" means any "issuer free writing prospectus," as defined in Rule 433 under the Securities Act, relating to the Public Securities that (A) is required to be filed with the Commission by the Company, or (B) is exempt from filing pursuant to Rule 433(d)(5)(i) or (d)(8) under the Securities Act, in each case in the form filed or required to be filed with the Commission or, if not required to be filed, in the form retained in the Company's records pursuant to Rule 433(g) under the Securities Act.

(B) At the time of filing of the Registration Statement and at the date hereof, the Company was not and is not an "ineligible issuer," as defined in Rule 405 under the Securities Act or an "excluded issuer" as defined in Rule 164 under the Securities Act.

(C) Each Issuer Free Writing Prospectus listed on Schedule III hereto satisfied, as of its issue date and at all subsequent times through the Prospectus Delivery Period (as defined below), all other conditions as may be applicable to its use as set forth in Rules 164 and 433 under the Securities Act, including any legend, record-keeping or other requirements.

(vi) **Financial Statements**. The financial statements of the Company, together with the related notes and schedules, included in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus comply in all material respects with the applicable requirements of the Securities Act and the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and the rules and regulations of the Commission thereunder, and fairly present the financial condition of the Company as of the dates indicated and the results of operations and changes in cash flows for the periods therein specified in conformity with U.S. generally accepted accounting principles ("GAAP") consistently applied throughout the periods involved. No other financial statements, pro forma financial information or schedules are

required under the Securities Act, the Exchange Act, or the Rules and Regulations to be included in the Registration Statement, the Time of Sale Disclosure Package or the Final Prospectus.

(vii) **Independent Accountants**. To the Company's knowledge, Deloitte & Touche LLP, which has expressed its opinion with respect to the financial statements included as part of the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus, is an independent public accounting firm with respect to the Company within the meaning of the Securities Act and the Rules and Regulations.

(viii) **Accounting Controls**. The Company and its subsidiaries maintain systems of "internal control over financial reporting" (as defined under Rules 13a-15 and 15d-15 under the Exchange Act) that are designed to comply with the requirements of the Exchange Act and have been designed by, or under the supervision of, their respective principal executive and principal financial officers, or persons performing similar functions, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with GAAP, and are designed to ensure that (A) transactions are executed in accordance with management's general or specific authorizations; (B) transactions are recorded as necessary to permit preparation of financial statements in conformity with GAAP and to maintain asset accountability; (C) access to assets is permitted only in accordance with management's general or specific authorization; and (D) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action is taken with respect to any differences. Since the date of the latest audited financial statements included in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus, there has been 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.

(ix) **Forward-Looking Statements**. The Company had a reasonable basis for, and made in good faith, each "forward-looking statement" (within the meaning of Section 27A of the Securities Act or Section 21E of the Exchange Act) included in the Registration Statement, the Time of Sale Disclosure Package, the Final Prospectus or the Marketing Materials.

(x) **Statistical and Marketing-Related Data**. Nothing has come to the attention of the Company that has caused the Company to believe that the statistical or market-related data included in the Registration Statement, the Time of Sale Disclosure Package or the Final Prospectus, or included in the Marketing Materials, are not based on or derived from sources that the Company reasonably believes to be reliable and accurate in all material respects. The Company has obtained the written consent of its customers for the use of any applicable case study data included in the Registration Statement, Time of Sale Disclosure Package or the Final Prospectus, to the extent required.

(xi) **Trading Market**. The Public Securities are registered pursuant to Section 12(b) of the Exchange Act and are approved for listing on The Nasdaq Stock Market ("Nasdaq").

(xii) **Absence of Manipulation**. The Company has not taken, directly or indirectly, any action that is designed to or that has constituted or that would reasonably be expected to cause or result in the stabilization or manipulation of the price of any security of the Company to facilitate the sale or resale of the Public Securities.

(xiii) **Investment Company Act**. The Company is not and, after giving effect to the offering and sale of the Public Securities and the application of the net proceeds thereof, will not be an "investment company," as such term is defined in the Investment Company Act of 1940, as amended.

(xiv) **Lock-Up Agreements**. Schedule V hereto contains a complete and accurate list of the Company's officers, directors and each beneficial owner of the Company's outstanding shares of Common Stock (or securities convertible or exercisable into shares of Common Stock) that the Company has caused to deliver to the Representative an executed Lock-Up Agreement (collectively, the "Lock-Up Parties"), in the form attached hereto as Exhibit A (the "Lock-Up Agreement"), prior to the execution of this Agreement.

(xv) **Disclosure of Agreements**. The agreements and documents described in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus conform in all material respects to the descriptions thereof contained therein and there are no agreements or other documents required by the Securities Act and the Rules and Regulations to be described in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus or to be filed with the Commission as exhibits to the Registration Statement, that have not been so described or filed. Each agreement or other instrument (however characterized or described) to which the Company or any of its subsidiaries is a party or by which it is or may be bound or affected and that is referred to in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus has been duly authorized and validly executed by the Company or its subsidiaries and is in full force and effect in all material respects and is enforceable against the Company or its subsidiaries and, to the Company's knowledge, the other parties thereto, in accordance with its terms, except (x) as such enforceability may be limited by bankruptcy, insolvency, reorganization or similar laws affecting creditors' rights generally, (y) as enforceability of any indemnification or contribution provision may be limited under the federal and state securities laws, and (z) that the remedy of specific performance and injunctive and other forms of equitable relief may be subject to the equitable defenses and to the discretion of the court before which any proceeding therefor may be brought. None of such agreements or instruments has been assigned by the Company or its subsidiaries, and neither the Company, its subsidiaries nor, to the Company's knowledge, any other party is in default thereunder and, to the Company's knowledge, no event has occurred that, with the lapse of time or the giving of notice, or both, would constitute a default thereunder. To the best of the Company's knowledge, performance by the Company or its subsidiaries of the material provisions of such agreements or instruments will not result in a violation of any existing applicable law, rule, regulation, judgment, order or decree of any governmental authority, agency or court, domestic or foreign, having jurisdiction over the Company or its subsidiaries or any of its assets or businesses, including, without limitation, those relating to Environmental Laws (as defined below).

(b) Any certificate signed by any officer of the Company and delivered to the Underwriters or to counsel for the Underwriters shall be deemed a representation and warranty by the Company to the Underwriters as to the matters covered thereby.

3. Representations and Warranties Regarding the Company.

(a) The Company represents and warrants to, and agrees with, the several Underwriters, as of the date hereof, as of the Closing Date and as of each Option Closing Date, if any, as follows:

(i) **Good Standing**. Each of the Company and its subsidiaries has been duly organized and is validly existing as a corporation or other entity in good standing under the laws of its jurisdiction of incorporation or organization. Each of the Company and its subsidiaries has the power and authority (corporate or otherwise) to own its properties and conduct its business as currently being carried on and as described in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus, and is duly qualified to do business as a foreign corporation or other entity in good standing in each jurisdiction in which it owns or leases real property or in which the conduct of its business makes such qualification necessary, except where the failure to so qualify would not have or be reasonably likely to result in a material adverse effect upon the business, properties, operations, financial position, results of operations or prospects of the Company and its subsidiaries, taken as a whole, or in its ability to perform its obligations under this Agreement ("Material Adverse Effect").

(ii) **Authorization**. The Company has the power and authority to enter into this Agreement, the Warrant Agreement dated as of the Closing Date between the Company and American Stock Transfer & Trust Company, LLC, as Warrant Agent (the "Warrant Agent") with respect to the Warrants, in the form attached as an exhibit to the Registration Statement (the "Warrant Agreement"), and the Underwriter Warrants (as defined below) and to authorize, issue and sell the Public Securities and the Underwriter Warrant Shares as contemplated by this Agreement, the Warrant Agreement and the Underwriter Warrants. This Agreement, the Warrant Agreement and the Underwriter Warrants have been duly authorized by the Company, and when executed and delivered by the Company, will constitute the valid, legal and binding obligations of the Company, enforceable against the Company in accordance with their respective terms, except as rights to indemnity hereunder may be limited by federal or state securities laws and except as such enforceability may be limited by bankruptcy, insolvency, reorganization or similar laws affecting the rights of creditors generally and subject to general principles of equity.

(iii) **Contracts**. The execution, delivery and performance of this Agreement, the Warrant Agreement and the Underwriter Warrants and the consummation of the transactions herein contemplated will not (A) result in a breach or violation of any of the terms and provisions of, or constitute a default under, any law, order, rule or regulation to which the Company or any subsidiary is subject, or by which any property or asset of the Company or any subsidiary is bound or affected, (B) conflict with, result in any violation or breach of, or constitute a default (or an event that with notice or lapse of time or both would become a default) under, or give to others any right of termination, amendment, acceleration or cancellation (with or without notice, lapse of time or both) (a "Default Acceleration Event") of, any agreement,

lease, credit facility, debt, note, bond, mortgage, indenture or other instrument (the "Contracts") or obligation or other understanding to which the Company or any subsidiary is a party or by which any property or asset of the Company or any subsidiary is bound or affected, except to the extent that such conflict, default, or Default Acceleration Event not reasonably likely to result in a Material Adverse Effect, or (C) result in a breach or violation of any of the terms and provisions of, or constitute a default under, the Company's certificate of incorporation or by-laws.

(iv) **No Violations of Governing Documents**. Neither the Company nor any of its subsidiaries is in violation, breach or default under its certificate of incorporation, by-laws or other equivalent organizational or governing documents.

(v) **Consents**. No consents, approvals, orders, authorizations or filings are required on the part of the Company in connection with the execution, delivery or performance of this Agreement, the Warrant Agreement and the Underwriter Warrants and the issue and sale of the Public Securities, except (A) the registration under the Securities Act of the Public Securities, which has been effected, (B) the necessary filings and approvals from Nasdaq to list the Public Securities and the Underwriter Warrant Shares, (C) such consents, approvals, authorizations, registrations or qualifications as may be required under state or foreign securities or Blue Sky laws and the rules of the Financial Industry Regulatory Authority, Inc. ("FINRA") in connection with the purchase of the Public Securities, Underwriter Warrants and the Underwriter Warrant Shares and distribution of the Public Securities by the several Underwriters, (D) such consents and approvals as have been obtained and are in full force and effect, and (E) such consents, approvals, orders, authorizations and filings the failure of which to make or obtain is not reasonably likely to result in a Material Adverse Effect.

(vi) **Capitalization**. The Company has an authorized capitalization as set forth in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus. All of the issued and outstanding shares of capital stock of the Company are duly authorized and validly issued, fully paid and nonassessable, have been issued in compliance in all material respects with all applicable securities laws and conform in all material respects to the description thereof in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus. 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 and, except as set forth in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus, are owned directly or indirectly by the Company, free and clear of all liens, encumbrances, equities or claims , except to the extent that such liens, encumbrances, equities or claims would not reasonably be expected to have a Material Adverse Effect. Except for the issuances of options or restricted stock in the ordinary course of business, since the respective dates as of which information is provided in the Registration Statement, the Time of Sale Disclosure Package or the Final Prospectus, the Company has not entered into or granted any convertible or exchangeable securities, options, warrants, agreements, contracts or other rights in existence to purchase or acquire from the Company any shares of the capital stock of the Company. The Units, when issued and paid for as provided herein, will be duly authorized and validly issued, fully paid and nonassessable, will be issued in compliance with all applicable securities laws, and will be free of preemptive, registration or similar rights and will conform in all material respects to the description of the capital stock of the Company contained in the

Registration Statement, the Time of Sale Disclosure Package and the Prospectus. The Underwriter Warrant Shares, when issued and paid for and delivered upon due exercise of the Underwriter Warrants, as provided herein, will be duly authorized and validly issued, fully paid and nonassessable, will be issued in compliance with all applicable securities laws, and will be free of preemptive, registration or similar rights and will conform in all material respects to the description of the capital stock of the Company contained in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus. The Warrant Shares, when issued, paid for and delivered upon due exercise of the Warrants, will be duly authorized and validly issued, fully paid and nonassessable, will be issued in compliance with all applicable securities laws, and will be free of preemptive, registration or similar rights. The Warrant Shares and the Underwriter Warrant Shares have been reserved for issuance. The Warrants, when issued, will conform in all material respects to the descriptions thereof set forth in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus. The Underwriter Warrants, when issued, will conform in all material respects to the descriptions thereof set forth in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus.

(vii) **Taxes**. Except as would not reasonably be expected to result in a Material Adverse Effect, each of the Company and its subsidiaries has (A) filed all foreign, federal, state and local tax returns (as hereinafter defined) required to be filed with taxing authorities prior to the date hereof or has duly obtained extensions of time for the filing thereof and (B) paid all taxes (as hereinafter defined) shown as due and payable on such returns that were filed and has paid all taxes imposed on or assessed against the Company or such respective subsidiary. The provisions for taxes payable, if any, shown on the financial statements included in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus are sufficient for all accrued and unpaid taxes, whether or not disputed, and for all periods to and including the dates of such consolidated financial statements. To the knowledge of the Company, no issues have been raised (and are currently pending) by any taxing authority in connection with any of the returns or taxes asserted as due from the Company or its subsidiaries, and no waivers of statutes of limitation with respect to the returns or collection of taxes have been given by or requested from the Company or its subsidiaries. The term "taxes" mean all federal, state, local, foreign, and other net income, gross income, gross receipts, sales, use, ad valorem, transfer, franchise, profits, license, lease, service, service use, withholding, payroll, employment, excise, severance, stamp, occupation, premium, property, windfall profits, customs, duties or other taxes, fees, assessments, or charges of any kind whatever, together with any interest and any penalties, additions to tax, or additional amounts with respect thereto. The term "returns" means all returns, declarations, reports, statements, and other documents required to be filed in respect to taxes.

(viii) **Material Change**. Since the respective dates as of which information is given in the Registration Statement, the Time of Sale Disclosure Package or the Final Prospectus, (A) neither the Company nor any of its subsidiaries has incurred any material liabilities or obligations, direct or contingent, or entered into any material transactions other than in the ordinary course of business, (B) the Company has not declared or paid any dividends or made any distribution of any kind with respect to its capital stock; (C) there has not been any change in the capital stock of the Company or any of its subsidiaries (other than a change in the number of outstanding shares of Common Stock due to the issuance of shares upon the exercise of outstanding options or warrants or upon the conversion of outstanding shares of preferred

stock or other convertible securities), (D) there has not been any material change in the Company's long-term or short-term debt, and (E) there has not been the occurrence of any Material Adverse Effect.

(ix) **Absence of Proceedings**. Other than as set forth in the Registration Statement, the Time of Sale Disclosure Package, the Preliminary Prospectus and the Final Prospectus, there is no pending or, to the knowledge of the Company, threatened action, suit or proceeding to which the Company or any of its subsidiaries is a party or of which any property or assets of the Company or any of its subsidiaries is the subject before or by any court or governmental agency, authority or body, or any arbitrator or mediator, which, if determined adversely to the Company or its subsidiaries, would individually or in the aggregate, reasonably be likely to result in a Material Adverse Effect.

(x) **Permits**. The Company and each of its subsidiaries holds, and is in compliance with, all franchises, grants, authorizations, licenses, permits, easements, consents, certificates and orders ("Permits") of any governmental or self-regulatory agency, authority or body (including, without limitation, those administered by the Food and Drug Administration of the U.S. Department of Health and Human Services (the "FDA") or by any foreign, federal, state or local governmental or regulatory authority performing functions similar to those performed by the FDA) required for the conduct of its business, and all such Permits are in full force and effect, in each case except where the failure to hold, or comply with, any of them is not reasonably likely to result in a Material Adverse Effect. The Company has not received notification of any material revocation, modification, suspension, termination or invalidation (or proceedings related thereto) of any such Permit. All such Permits are free and clear of any material restriction or condition that are in addition to, or materially different from those normally applicable to similar licenses, certificates, authorizations and permits. The Company has not received notification of any material revocation, modification, suspension, termination or invalidation (or proceedings related thereto) of any such Permit.

(xi) **Compliance** Except as described in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus, the Company and its subsidiaries: (A) are and at all times have been in compliance with all statutes, rules, and regulations applicable to Company and its subsidiaries related to the ownership, testing, development, manufacture, packaging, processing, use, distribution, marketing, labeling, promotion, sale, offer for sale, storage, import, export or disposal of any product manufactured or distributed by the Company ("Applicable Laws"), except as would not, individually or in the aggregate, reasonably be expected to result in a Material Adverse Effect; (B) have not received any U.S. Food and Drug Administration, or FDA, Form 483, notice of adverse finding, warning letter, untitled letter or other correspondence or notice from any governmental authority alleging or asserting noncompliance with any Applicable Laws or any licenses, certificates, approvals, clearances, authorizations, permits and supplements or amendments thereto required by any such Applicable Laws ("Authorizations"); (C) possess all material Authorizations and such Authorizations are valid and in full force and effect and are not in material violation of any term of any such Authorizations; (D) have not received notice of any claim, action, suit, proceeding, hearing, enforcement, investigation, arbitration or other action from any governmental authority or third party alleging that any product operation or activity is in violation of any Applicable Laws or Authorizations and have no knowledge that any such governmental authority or third party is

considering any such claim, litigation, arbitration, action, suit, investigation or proceeding; (E) have not received notice that any governmental authority has taken, is taking or intends to take action to limit, suspend, modify or revoke any Authorizations and the Company has no knowledge that any such governmental authority is considering such action; (F) have not, either voluntarily or involuntarily, initiated, conducted, or issued or caused to be initiated, conducted or issued, any recall, market withdrawal or replacement, safety alert, post-sale warning, "dear doctor" letter, or other notice or action relating to the alleged lack of safety, efficacy or regulatory compliance of any product or any alleged product defect or violation and, to the Company's knowledge, no third party has initiated or conducted any such notice or action and there are no facts which are reasonably likely to cause, and the Company has not received any written notice from the FDA or any other regulatory agency regarding, a material recall, market withdrawal or replacement of any Company product sold or intended to be sold by the Company, a material change in the marketing classification or a material adverse change in the labeling of any such Company products, or a termination or suspension of the manufacturing, marketing, or distribution of such Company products; and (G) have filed, obtained, maintained or submitted all material reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments as required by any Applicable Laws or Authorizations and that all such reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments were complete and correct in all material respects on the date filed (or were corrected or supplemented by a subsequent submission).

(xii) **Good Title**. The Company and each of its subsidiaries have good and marketable title to all property (whether real or personal) described in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus as being owned by them that are material to the business of the Company, in each case free and clear of all liens, claims, security interests, other encumbrances or defects, except those that are disclosed in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus and those that are not reasonably likely to result in a Material Adverse Effect. The property held under lease by the Company and its subsidiaries is held by them, to their knowledge, under valid, subsisting and enforceable leases with only such exceptions as are not material and with respect to any particular lease as do not interfere in any material respect with the conduct of the business of the Company and its subsidiaries.

(xiii) **Intellectual Property**. For convenience, any or all of patents, patent applications, 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 and/or other intellectual property may be referred to herein as "Intellectual Property". To the Company's knowledge, the Company and each of its subsidiaries owns, or has valid, binding and enforceable licenses or other rights under, the Intellectual Property necessary for, or used in the conduct, or the proposed conduct, of the business of the Company in the manner described in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus. To the Company's knowledge, the issued patents, trademarks, and copyrights, if any, included within the Intellectual Property are valid, enforceable, and subsisting. To the knowledge of the Company, no action or use by the Company or any of its subsidiaries involves or gives rise to any infringement of, or license or similar fees for, any Intellectual Property of others. Additionally, to the Company's knowledge, except as disclosed in the Registration Statement, the Time of Sale Disclosure Package and the

Final Prospectus: (A) the Company is not obligated to pay a material royalty, grant a license to, or provide other material consideration to any third party in connection with the Intellectual Property, other than as disclosed in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus, (B) the Company has not received any notice of any claim of infringement, misappropriation or conflict with any asserted rights of others with respect to any of the Company's products or product candidates, processes or Intellectual Property, (C) neither the sale nor use of any of the discoveries, inventions, products or product candidates or processes of the Company referred to in the Registration Statement, the Time of Sale Disclosure Package or the Final Prospectus do or will, infringe, misappropriate or violate any right or valid patent claim of any third party, except to the extent that such infringement, misappropriation or violation is not reasonably likely to result in a Material Adverse Effect, and (D) no third party has any ownership right in or to any Intellectual Property that is owned by the Company, other than any co-owner of any patent who is listed on the records of the U.S. Patent and Trademark Office (the "USPTO") and any co-owner of any patent application who is named in such patent application, and, to the Company's knowledge, no third party has any ownership right in or to any Intellectual Property in any field of use that is exclusively licensed to the Company, other than any licensor to the Company of such Intellectual Property.

(xiv) **Patents and Patent Applications**. To the Company's knowledge, all patents and patent applications owned by or licensed to the Company or under which the Company has rights have been duly and properly filed and maintained; to the knowledge of the Company, the parties prosecuting such applications have complied with their duty of candor and disclosure to the USPTO in connection with such applications; and the Company is not aware of any facts required to be disclosed to the USPTO that were not disclosed to the USPTO and which could reasonably be expected to preclude the grant of a patent in connection with any such application or could reasonably be expected to form the basis of a finding of invalidity with respect to any patents that have issued with respect to such applications.

(xv) **Employment Matters**. There is (A) no unfair labor practice complaint pending against the Company or any of its subsidiaries nor, to the Company's knowledge, threatened, before the National Labor Relations Board, any state or local labor relation board or any foreign labor relations board, and no grievance or arbitration proceeding arising out of or under any collective bargaining agreement is so pending against the Company or any of its subsidiaries, or, to the Company's knowledge, threatened against it or any of its subsidiaries and (B) no material labor disturbance by the employees of the Company or any of its subsidiaries exists or, to the Company's knowledge, is imminent, and the Company is not aware of any existing or imminent material labor disturbance by the employees of any of its, or its subsidiaries', principal suppliers, manufacturers, customers or contractors that could reasonably be expected, singularly or in the aggregate, to have a Material Adverse Effect. The Company is not aware that any key employee or significant group of employees of the Company or any subsidiary plans to terminate employment with the Company or any such subsidiary.

(xvi) **ERISA Compliance**. No "prohibited transaction" (as defined in Section 406 of the Employee Retirement Income Security Act of 1974, as amended, including the regulations and published interpretations thereunder ("ERISA"), or Section 4975 of the Internal Revenue Code of 1986, as amended from time to time (the "Code")) or "accumulated funding deficiency" (as defined in Section 302 of ERISA) or any of the events set forth in

Section 4043(b) of ERISA (other than events with respect to which the thirty (30)-day notice requirement under Section 4043 of ERISA has been waived) has occurred or could reasonably be expected to occur with respect to any "employee benefit plan" (as defined under ERISA) established or maintained by the Company or any of its subsidiaries which would reasonably be expected to, singularly or in the aggregate, have a Material Adverse Effect. Each "employee benefit plan" established or maintained by the Company or any of its subsidiaries is in compliance in all material respects with applicable law, including ERISA and the Code. Neither the Company nor any of its subsidiaries has incurred or reasonably expects to incur any material liability under (A) Title IV of ERISA with respect to the termination of, or withdrawal from, any "employee benefit plan" or (B) Sections 412, 4971, 4975 or 4980B of the Code. Each "employee benefit plan" established or maintained by the Company or its subsidiaries that is intended to be qualified under Section 401(a) of the Code is so qualified, and, to the Company's knowledge, nothing has occurred, whether by action or by failure to act, which could, singularly or in the aggregate, cause the loss of such qualification.

(xvii) **Environmental Matters**. The Company and its subsidiaries are in compliance with all foreign, federal, state and local rules, laws and regulations relating to the use, treatment, storage and disposal of hazardous or toxic substances or waste and protection of health and safety or the environment which are applicable to their businesses ("Environmental Laws"), except where the failure to comply has not had and would not reasonably be expected to have, singularly or in the aggregate, a Material Adverse Effect. There has been no storage, generation, transportation, handling, treatment, disposal, discharge, emission, or other release of any kind of toxic or other wastes or other hazardous substances by, due to, or caused by the Company or any of its subsidiaries (or, to the Company's knowledge, any other entity for whose acts or omissions the Company or any of its subsidiaries is or may otherwise be liable) upon any of the property now or previously owned or leased by the Company or any of its subsidiaries, or upon any other property, in violation of any law, statute, ordinance, rule, regulation, order, judgment, decree or permit or which would, under any law, statute, ordinance, rule (including rule of common law), regulation, order, judgment, decree or permit, give rise to any liability, except for any violation or liability which has not had and would not reasonably be expected to have, singularly or in the aggregate, a Material Adverse Effect; and there has been no disposal, discharge, emission or other release of any kind onto such property or into the environment surrounding such property of any toxic or other wastes or other hazardous substances with respect to which the Company or any of its subsidiaries has knowledge.

(xviii) **SOX Compliance**. The Company has taken all necessary actions to ensure that, at the Effective Time of the Registration Statement, it will be in compliance in all material respects with all provisions of the Sarbanes-Oxley Act of 2002 and all rules and regulations promulgated thereunder or implementing provisions thereof (collectively, the "Sarbanes-Oxley Act") that are then in effect and with which the Company is required to be in compliance with as of the Effective Time of the Registration Statement (taking into account all exemptions and phase-in periods provided under the Jumpstart Our Business Startups Act and otherwise under applicable law).

(xix) **Accounting Controls and Disclosure Controls**. Except as disclosed in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus, the Company maintains internal control over financial reporting (as defined under

Rule 13-a15 and 15d-15 under the rules and regulations of the Commission under the Exchange Act (the "Exchange Act Regulations")) and a system of internal accounting controls designed to provide reasonable assurances that (A) transactions are executed in accordance with management's general or specific authorization; (B) transactions are recorded as necessary to permit preparation of financial statements in conformity with GAAP and to maintain accountability for assets; (C) access to assets is permitted only in accordance with management's general or specific authorization; and (D) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action is taken with respect to any differences, in each case, to the extent applicable to an Emerging Growth Company and a "smaller reporting company" as defined in Section 12b-2 of the Exchange Act. Except as described in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus, since the end of the Company's most recent audited fiscal year, there has been (1) no material weakness in the Company's internal control over financial reporting (whether or not remediated) and (2) no change in the Company's internal control over financial reporting that has materially adversely affected, or is reasonably likely to materially adversely affect, the Company's internal control over financial reporting.

(xx) **Money Laundering Laws**. The operations of the Company and its subsidiaries are and have been conducted at all times in compliance in all material respects with applicable financial recordkeeping and reporting requirements of the Currency and Foreign Transactions Reporting Act of 1970, as amended, the money laundering statutes of all jurisdictions, the rules and regulations thereunder and any related or similar rules, regulations or guidelines, issued, administered or enforced by any Governmental Entity (collectively, the "Money Laundering Laws"); and no action, suit or proceeding by or before any Governmental Entity involving the Company or any of its subsidiaries with respect to the Money Laundering Laws is pending or, to the knowledge of the Company, threatened. "Governmental Entity" shall be defined as any arbitrator, court, governmental body, regulatory body, administrative agency or other authority, body or agency (whether foreign or domestic) having jurisdiction over the Company or any of its subsidiaries or any of their respective properties, assets or operations.

(xxi) **Foreign Corrupt Practices Act**. Neither the Company nor any of its subsidiaries, nor any director or officer of the Company or any of its subsidiaries, nor, to the knowledge of the Company, any employee, representative, agent, affiliate of the Company or any of its subsidiaries, or any other person acting on behalf of the Company or any of its subsidiaries, is aware of or has taken any action, directly or indirectly, that would result in a violation by such persons of the Foreign Corrupt Practices Act of 1977, as amended, and the rules and regulations thereunder (the "FCPA"), including, without limitation, making use of the mails or any means or instrumentality of interstate commerce corruptly in furtherance of an offer, payment, promise to pay or authorization of the payment of any money, or other property, gift, promise to give, or authorization of the giving of anything of value to any "foreign official" (as such term is defined in the FCPA) or any foreign political party or official thereof or any candidate for foreign political office, in contravention of the FCPA and the Company and, to the knowledge of the Company, its affiliates have conducted their businesses in compliance with the FCPA and have instituted and maintained policies and procedures designed to ensure and promote continued compliance therewith.

(xxii) **OFAC**. Neither the Company nor any of its subsidiaries or any director or officer of the Company or any of its subsidiaries, nor, to the knowledge of the Company, any employee, representative, agent or affiliate of the Company or any of its subsidiaries or any other person acting on behalf of the Company or any of its subsidiaries is currently subject to any U.S. sanctions administered by the Office of Foreign Assets Control of the U.S. Treasury Department ("OFAC"); and the Company will not directly or indirectly use the proceeds of the offering of the Public Securities contemplated hereby, or lend, contribute or otherwise make available such proceeds to any person or entity, for the purpose of financing the activities of any person currently subject to any U.S. sanctions administered by OFAC.

(xxiii) **Insurance**. The Company and each of its subsidiaries carries or is entitled to the benefits of insurance, with financially sound and reputable insurers, in such amounts and covering such risks as are commercially reasonable and customary and generally maintained by companies of established repute engaged in the same or similar business, and all such insurance is in full force and effect. The Company has no reason to believe that it and its subsidiaries will not be able (A) to renew its existing insurance coverage as and when such policies expire or (B) to obtain comparable coverage from similar institutions as may be necessary or appropriate to conduct its business as now conducted and at a cost that would not result in a Material Adverse Effect. The Company has not been denied any insurance coverage which it has sought or for which it has applied.

(xxiv) **No Violation**. Neither the Company nor any its subsidiaries nor, to its knowledge, any other party is in violation, breach or default of any Contract (as defined below) that has resulted in or could reasonably be expected to result in a Material Adverse Effect.

(xxv) **Continued Business**. No supplier, customer, distributor or sales agent of the Company or any subsidiary has notified the Company or any subsidiary that it intends to discontinue or decrease the rate of business done with the Company or any subsidiary, except where such discontinuation or decrease has not resulted in and could not reasonably be expected to result in a Material Adverse Effect.

(xxvi) **Transactions Affecting Disclosure to FINRA**.

(1) No Finder's Fee. There are no claims, payments, issuances, arrangements or understandings for services in the nature of a finder's, consulting or origination fee with respect to the introduction of the Company to any Underwriter or the sale of the Public Securities hereunder or, except as contemplated in this Agreement, any other arrangements, agreements, understandings, payments or issuances with respect to the Company that may affect the Underwriters' compensation, as determined by FINRA.

(2) Payments Within Twelve (12) Months. Except as disclosed to the Representative in writing, the Company has not made any direct or indirect payments (in cash, securities or otherwise) to: (A) any person, as a finder's fee, consulting fee or otherwise, in consideration of such person raising capital for the Company or introducing to the Company persons who raised or provided capital to the Company; (B) any FINRA member; or (C) any person or entity that has any direct or indirect affiliation or association with any FINRA

member, within the twelve (12) months prior to the Effective Time of the Registration Statement, other than the payment to the Underwriters in connection with the public offering contemplated hereunder.

(3) Use of Proceeds. None of the net proceeds of the public offering contemplated hereunder will be paid by the Company to any participating FINRA member or its affiliates, except as specifically authorized herein.

(4) No FINRA Affiliations. Except as disclosed to the Representative in writing, there is no: (A) officer or director of the Company or its subsidiaries, (B) beneficial owner of 5% or more of any class of the Company's securities or (C) beneficial owner of the Company's unregistered equity securities which were acquired during the 180-day period immediately preceding the filing of the Registration Statement that is an affiliate or associated person of a FINRA member participating in the public offering contemplated hereunder (as determined in accordance with the rules and regulations of FINRA). The Company will advise the Representative if it becomes aware that any of the persons referred to in clauses (A), (B) or (C) of the immediately preceding sentence is or becomes an affiliate or associated person of a FINRA member participating in the public offering contemplated hereunder.

(xxvii) **No Financial Advisor**. Other than the Underwriters, no person has the right to act as an underwriter or as a financial advisor to the Company in connection with the transactions contemplated hereby.

(xxviii) **Certain Statements**. The statements set forth in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus under the caption "Description of Capital Stock," insofar as they purport to constitute a summary of (A) the terms of the Company's outstanding securities, (B) the terms of the Public Securities, the Underwriter Warrants and the Underwriter Warrant Shares, and (C) the terms of the documents referred to therein, are accurate and fair in all material respects.

(xxix) **Related Party Transactions** There are no outstanding loans, advances (except normal advances for business expenses in the ordinary course of business) or guarantees of indebtedness by the Company to or for the benefit of any of the officers or directors of the Company or any of their respective family members, except as disclosed in the Registration Statement or the Time of Sale Disclosure Package and the Final Prospectus. All material transactions by the Company with office holders or control persons of the Company have been duly approved by the board of directors of the Company, or duly appointed committees or officers thereof, if and to the extent required under U.S. law.

(xxx) **No Registration Rights**. Except as described in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus, there are no contracts, agreements or understandings between the Company and any person granting such person the right (other than rights which have been waived in writing or otherwise satisfied) to require the Company to file a registration statement under the Securities Act with respect to any securities of the Company owned or to be owned by such person or to require the Company to include such securities with the Public Securities registered pursuant to the Registration Statement or with any

securities being registered pursuant to any other registration statement filed by the Company under the Securities Act.

(xxxi) **Statistical and Market-Related Data**. No facts have come to the Company's attention that causes it to believe that any statistical and market-related data included in the Registration Statement, the Time of Sale Disclosure Package or the Final Prospectus is not based on or derived from sources that the Company believes to be reliable and accurate in all material respects, and, to the extent required, the Company has obtained the written consent to the use of such data from such sources.

(b) Any certificate signed by any officer of the Company and delivered to the Representative on behalf of the Underwriters or to counsel for the Underwriters shall be deemed a representation and warranty by the Company to the Underwriters as to the matters covered thereby.

4. Purchase, Sale and Delivery of Units.

(a) On the basis of the representations, warranties and agreements herein contained, but subject to the terms and conditions herein set forth, the Company agrees to issue and sell the Firm Units to the several Underwriters, and the several Underwriters agree, severally and not jointly, to purchase the Firm Units set forth opposite the names of the Underwriters in Schedule I hereto. The purchase price for each Firm Units shall be $[ ] per Firm Unit.

(b) The Company hereby grants to the Underwriters the option to purchase some or all of the Option Units and, upon the basis of the warranties and representations and subject to the terms and conditions herein set forth, the Underwriters shall have the right, severally and not jointly, to purchase at the purchase price set forth in Section 4(a) all or any portion of the Option Units as may be necessary to cover over-allotments made in connection with the transactions contemplated hereby. This option may be exercised by the Underwriters at any time and from time to time on or before the thirtieth (30th) day following the date hereof, by written notice to the Company (the "Option Notice"), but in no event after the Separation Date. The Option Notice shall set forth the aggregate number of Option Units as to which the option is being exercised, and the date and time when the Option Units are to be delivered (such date and time being herein referred to as the "Option Closing Date"); *provided*, *however*, that the Option Closing Date shall not be earlier than the Closing Date (as defined below) nor earlier than the first business day after the date on which the option shall have been exercised nor later than the fifth business day after the date on which the option shall have been exercised unless the Company and the Underwriters otherwise agree. If the Underwriters elect to purchase less than all of the Option Units, the Company agrees to sell to the Underwriters the number of Option Units obtained by multiplying the number of Option Units specified in such notice by a fraction, the numerator of which is the number of Option Units set forth opposite the name of the Underwriters in Schedule I hereto under the caption "Number of Option Units to be Sold" and the denominator of which is the total number of Option Units.

(c) Payment of the purchase price for and delivery of the Option Units shall be made on the Option Closing Date in the same manner and at the same office as the payment for the Firm Units as set forth in subparagraph (d) below.

(d) The Firm Units will be delivered by the Company to the Representative, for the respective accounts of the several Underwriters, against payment of the purchase price therefor by wire transfer of same day funds payable to the order of the Company at the offices of Roth Capital Partners, LLC, 888 San Clemente Drive, Suite 400, Newport Beach, CA 92660, or such other location as may be mutually acceptable, at 6:00 a.m. Pacific Time, on the third (or if the Firm Units are priced, as contemplated by Rule 15c6-1(c) under the Exchange Act, after 4:30 p.m. Eastern time, the fourth) full business day following the date hereof, or at such other time and date as the Representative and the Company determine pursuant to Rule 15c6-1(a) under the Exchange Act, or, in the case of the Option Units, at such date and time set forth in the Option Notice. The time and date of delivery of the Firm Units is referred to herein as the "Closing Date." On the Closing Date, the Company shall deliver the Firm Units, which shall be registered in the name or names, and shall be in such denominations, as the Representative may request on behalf of the Underwriters at least one (1) business day before the Closing Date, to the respective accounts of the several Underwriters, which delivery shall be made through the facilities of the Depository Trust Company's DWAC system.

(e) On the Closing Date and on each Option Closing Date, the Company shall issue to the Underwriters (and/or their designees), warrants (the "Underwriter Warrants"), in the form attached hereto as Exhibit C, for the purchase of a number of shares of Common Stock equal to (i) in the case of the Closing Date, 3% of the Firm Shares to be issued on the Closing Date or (ii) in the case of an Option Closing Date, 3% of the Option Shares to be issued on such Option Closing Date, in each case, which shall be registered in the name or names, and shall be in such denominations, as the Representative may request at least one (1) business day before the Closing Date or such Option Closing Date, as the case may be. The Underwriter Warrants shall be allocated to the Underwriters ratably based on the number of Firm Shares or Option Shares purchased by each Underwriter as set forth on Schedule I hereto. The shares of Common Stock underlying the Underwriter Warrants are referred to herein as the "Underwriter Warrant Shares."

5. Covenants.

The Company covenants and agrees with the Underwriters as follows:

(a) The Company shall prepare the Final Prospectus in a form approved by the Underwriters and file such Final Prospectus pursuant to Rule 424(b) under the Securities Act not later than the Commission's close of business on the second (2nd) business day following the execution and delivery of this Agreement, or, if applicable, such earlier time as may be required by the Rules and Regulations.

(b) During the period beginning on the date hereof and ending on the later of the Closing Date or such date as determined by the Underwriters the Final Prospectus is no longer required by law to be delivered in connection with sales by an underwriter or dealer (the "Prospectus Delivery Period"), prior to amending or supplementing the Registration Statement, including any Rule 462 Registration Statement, the Time of Sale Disclosure Package or the Final Prospectus, the Company shall furnish to the Underwriters for review and comment a copy of each such proposed amendment or supplement, and the Company shall not file any such proposed amendment or supplement to which the Underwriters reasonably object.

(c) From the date of this Agreement until the end of the Prospectus Delivery Period, the Company shall promptly advise the Representative in writing (i) of the receipt of any comments of, or requests for additional or supplemental information from, the Commission, (ii) of the time and date of any filing of any post-effective amendment to the Registration Statement or any amendment or supplement to the Time of Sale Disclosure Package, the Final Prospectus or any Issuer Free Writing Prospectus, (iii) of the time and date that any post-effective amendment to the Registration Statement becomes effective and (iv) of the issuance by the Commission of any stop order suspending the effectiveness of the Registration Statement or of any order preventing or suspending its use or the use of the Time of Sale Disclosure Package, the Final Prospectus or any Issuer Free Writing Prospectus, or of any proceedings to remove, suspend or terminate from listing or quotation the Common Stock from any securities exchange upon which it is listed for trading or included or designated for quotation, or of the threatening or initiation of any proceedings for any of such purposes. If the Commission shall enter any such stop order at any time during the Prospectus Delivery Period, the Company will use its reasonable efforts to obtain the lifting of such order at the earliest possible moment. Additionally, the Company agrees that it shall comply with the provisions of Rules 424(b), 430A and 430C under the Securities Act, as applicable, and will use its reasonable efforts to confirm that any filings made by the Company under Rule 424(b) or Rule 433 were received in a timely manner by the Commission (without reliance on Rule 424(b)(8) or 164(b) of the Securities Act).

(d) (i) During the Prospectus Delivery Period, the Company will comply with all requirements imposed upon it by the Securities Act, as now and hereafter amended, and by the Rules and Regulations, as from time to time in force, and by the Exchange Act, as now and hereafter amended, so far as necessary to permit the continuance of sales of or dealings in the Public Securities as contemplated by the provisions hereof, the Time of Sale Disclosure Package, the Registration Statement and the Final Prospectus. If during the Prospectus Delivery Period any event occurs the result of which would cause the Final Prospectus (or if the Final Prospectus is not yet available to prospective purchasers, the Time of Sale Disclosure Package) to include an 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 then existing, not misleading, or if during such period it is necessary or appropriate in the opinion of the Company or its counsel or the Representative or counsel to the Underwriters to amend the Registration Statement or supplement the Final Prospectus (or if the Final Prospectus is not yet available to prospective purchasers, the Time of Sale Disclosure Package) to comply with the Securities Act, the Company will promptly notify the Representative, allow the Underwriters the opportunity to provide reasonable comments on such amendment, prospectus supplement or document, and will amend the Registration Statement or supplement the Final Prospectus (or if the Final Prospectus is not yet available to prospective purchasers, the Time of Sale Disclosure Package) or file such document (at the expense of the Company) so as to correct such statement or omission or effect such compliance.

(ii) If at any time during the Prospectus Delivery Period there occurred or occurs an event or development the result of which such Issuer Free Writing Prospectus conflicted or would conflict with the information contained in the Registration Statement or any Prospectus or included or would include, when taken together with the Time of Sale Disclosure Package, 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 prevailing at

that subsequent time, not misleading, the Company will promptly notify the Underwriters and will promptly amend or supplement, at its own expense, such Issuer Free Writing Prospectus to eliminate or correct such conflict, untrue statement or omission.

(e) The Company shall take or cause to be taken all necessary action to qualify the Shares for sale under the securities laws of such jurisdictions as the Underwriters reasonably designate and to continue such qualifications in effect so long as required for the distribution of the Public Securities, except that the Company shall not be required in connection therewith to qualify as a foreign corporation or as a dealer in securities in any jurisdiction in which it is not so qualified, to execute a general consent to service of process in any state or to subject itself to taxation in respect of doing business in any jurisdiction in which it is not otherwise subject.

(f) The Company will furnish to the Underwriters and counsel to the Underwriters copies of the Registration Statement, each Prospectus, any Issuer Free Writing Prospectus, and all amendments and supplements to such documents, in each case as soon as available and in such quantities as the Underwriters may from time to time reasonably request.

(g) The Company will make generally available to its security holders as soon as practicable, but in any event not later than fifteen (15) months after the end of the Company's current fiscal quarter, an earnings statement (which need not be audited) covering a 12-month period that shall satisfy the provisions of Section 11(a) of the Securities Act and Rule 158 of the Rules and Regulations.

(h) The Company, whether or not the transactions contemplated hereunder are consummated or this Agreement is terminated, will pay or cause to be paid (i) all expenses incurred in connection with the delivery to the Underwriters of the Public Securities (including transfer taxes allocated to the respective transferees, all fees and expenses of the registrar and transfer agent of the Public Securities (if other than the Company) and the cost of preparing and printing warrant certificates), (ii) all expenses and fees (including, without limitation, fees and expenses of the Company's counsel) in connection with the preparation, printing, filing, delivery, and shipping of the Registration Statement (including the financial statements therein and all amendments, schedules, and exhibits thereto), the Public Securities and the Underwriter Warrants, the Time of Sale Disclosure Package, any Prospectus, any Issuer Free Writing Prospectus and any amendment thereof or supplement thereto, (iii) all reasonable filing fees and reasonable fees and disbursements of the Underwriter's counsel incurred in connection with the qualification of the Public Securities for offering and sale by the Underwriter or by dealers under the securities or blue sky laws of the states and other jurisdictions that the Underwriter shall designate in an amount not to exceed $10,000, (iv) the fees and expenses of any transfer agent or registrar (v) the reasonable filing fees and reasonable fees and disbursements of Underwriter's counsel incident to any required review and approval by FINRA, of the terms of the sale of the Public Securities, (vi) all fees and expenses relating to the listing of the Public Securities on Nasdaq, (vii) the fees and expenses of the Company's accountants, (viii) the costs and expenses of any Testing-the-Waters Communications, (ix) the costs and expenses of the Company relating to investor presentations on any "road show" undertaken in connection with the marketing of the Public Securities, including, without limitation, expenses associated with the production of road show slides and graphics, fees and expenses of any consultants (not including the Underwriters

and their representatives) engaged in connection with the road show presentations, and travel and lodging expenses of the representatives and officers of the Company and any such consultants (not including the Underwriters and their representatives), and (x) all other costs and expenses incident to the performance of its obligations hereunder that are not otherwise specifically provided for herein. The Company will reimburse the Representative for the reasonable and documented out-of-pocket expenses of the Underwriters incurred in connection with the offer and sale of the Public Securities contemplated hereby, including the fees and disbursements of its counsel , in an aggregate amount not to exceed (i) $150,000 in the event that the transactions contemplated hereunder are consummated (which amount shall include the Advance (as hereinafter defined)) or (ii) $75,000 in the event that the transactions contemplated hereunder are not consummated (which amount shall include the Advance). The Company has heretofore paid to the Representative $40,000 as an advance against the Underwriters anticipated out-of-pocket expenses (the "Advance").

(i) The Company intends to apply the net proceeds from the sale of the Public Securities to be sold by it hereunder for the purposes set forth in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus under the heading "Use of Proceeds".

(j) The Company has not taken and will not take, directly or indirectly, any action designed to, or which might reasonably be expected to cause or result in, or that has constituted, the stabilization or manipulation of the price of any security of the Company to facilitate the sale or resale of the Public Securities.

(k) The Company represents and agrees that, unless it obtains the prior written consent of the Representative, and each Underwriter, severally, and not jointly, represents and agrees that, unless it obtains the prior written consent of the Company, it has not made and will not make any offer relating to the Public Securities that would constitute an Issuer Free Writing Prospectus; provided that the prior written consent of the parties hereto shall be deemed to have been given in respect of the free writing prospectuses included in Schedule III. Any such free writing prospectus set forth on Schedule III and consented to by the Company and the Representative is hereinafter referred to as a "Permitted Free Writing Prospectus." The Company represents that it has treated, or agrees that it will treat, each Permitted Free Writing Prospectus as an "issuer free writing prospectus," as defined in Rule 433, and has complied or will comply with the requirements of Rule 433 applicable to any Permitted Free Writing Prospectus, including timely Commission filing where required, legending and record-keeping.

(l) The Company hereby agrees that, without the prior written consent of the Representative, it will not, during the period ending one hundred eighty (180) days after the date hereof ("Lock-Up Period"), (i) offer, pledge, issue, sell, contract to sell, purchase, contract 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 (ii) 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 (i) or (ii) above is to be settled by delivery of Common Stock or such other securities, in cash or otherwise; or (iii) 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

sentence shall not apply to (A) the Public Securities to be sold hereunder, (B) the issuance of Common Stock upon the exercise of options or warrants, vesting or settlement of restricted stock units, or the conversion of outstanding preferred stock or other outstanding convertible securities disclosed as outstanding in the Registration Statement (excluding exhibits thereto), the Time of Sale Disclosure Package, and the Final Prospectus, (C) the issuance of employee stock options not exercisable during the Lock-Up Period and the grant of restricted stock awards or restricted stock units or shares of Common Stock pursuant to equity incentive plans described in the Registration Statement (excluding exhibits thereto), the Time of Sale Disclosure Package, and the Final Prospectus, or (D) the filing of a registration statement on Form S-8 to register shares of Common Stock issuable pursuant to the terms of any stock option, stock bonus or other stock plan or arrangement described in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus. Notwithstanding the foregoing, if (1) the Company is not an Emerging Growth Company; and (2) either (i) during the period that begins on the date that is 17 days before the last day of the Lock-Up Period and ends on the last day of the Lock-Up Period, the Company issues an earnings release or material news or a material event relating to the Company occurs; or (ii) if prior to the expiration of the Lock-Up Period, the Company announces that it will release earnings results during the 16-day period beginning on the last day of the Lock-Up Period, then the restrictions imposed by this Section 5(l) shall continue to apply until the expiration of the date that is 18 days after the date on which the issuance of the earnings release or the material news or material event occurs; provided, however, that this sentence will not apply if, within three (3) days of the termination of the Lock-Up Period, the Company delivers to the Representative a certificate, signed by the Chief Financial Officer or Chief Executive Officer of the Company, certifying on behalf of the Company that the shares of Common Stock are, as of the date of delivery of such certificate, “actively traded securities,” within the meaning of Rule 101 of Regulation M promulgated under the Exchange Act.

(m) The Company hereby agrees to engage and maintain, at its expense, a registrar and transfer agent for the Public Securities.

(n) The Company hereby agrees to use its best efforts to obtain approval to list (i) the Public Securities and (ii) the Underwriter Warrant Shares on Nasdaq; it being understood that, in the case of (ii), such listing application may not be made until the earlier of (x) the date the Underwriter Warrants are registered with the Commission and (y) 180 days after the Closing Date. The Company further agrees to use its reasonable best efforts to effect and maintain the listing of the Public Securities on the Nasdaq Stock Market for at least three years from the date of this Agreement (except with respect to the Units, which listing shall be maintained until the Separation Date).

(o) The Company will promptly notify the Representative if the Company ceases to be an Emerging Growth Company at any time prior to the later of (i) the end of the Prospectus Delivery Period and (ii) the expiration of the Lock-Up Period described in Section 5(l) above.

6. Conditions of the Underwriters’ Obligations. The respective obligations of the several Underwriters hereunder to purchase the Public Securities are subject to the accuracy, as of the date hereof and at all times through the Closing Date, and on each Option Closing Date (as if made on the Closing Date or such Option Closing Date, as applicable), of and compliance with

all representations, warranties and agreements of the Company contained herein, the performance by the Company of its obligations hereunder and the following additional conditions:

(a) If filing of the Final Prospectus, or any amendment or supplement thereto, or any Issuer Free Writing Prospectus, is required under the Securities Act or the Rules and Regulations, the Company shall have filed the Final Prospectus (or such amendment or supplement) or such Issuer Free Writing Prospectus with the Commission in the manner and within the time period so required (without reliance on Rule 424(b)(8) or 164(b) under the Securities Act); the Registration Statement shall remain effective; no stop order suspending the effectiveness of the Registration Statement or any part thereof, any Rule 462 Registration Statement, or any amendment thereof, nor suspending or preventing the use of the Time of Sale Disclosure Package, any Prospectus, the Final Prospectus or any Issuer Free Writing Prospectus shall have been issued; no proceedings for the issuance of such an order shall have been initiated or threatened by the Commission; any request of the Commission or the Representative for additional information (to be included in the Registration Statement, the Time of Sale Disclosure Package, any Prospectus, the Final Prospectus, any Issuer Free Writing Prospectus or otherwise) shall have been complied with to the satisfaction of the Representative.

(b) The Public Securities shall be approved for listing on Nasdaq, subject to official notice of issuance.

(c) FINRA shall have raised no objection to the fairness and reasonableness of the underwriting terms and arrangements.

(d) The Underwriters shall not have reasonably determined, and advised the Company, that the Registration Statement, the Time of Sale Disclosure Package, any Prospectus, the Final Prospectus, or any amendment thereof or supplement thereto, or any Issuer Free Writing Prospectus, contains an untrue statement of fact which, in the reasonable opinion of the Underwriters, is material, or omits to state a fact which, in the reasonable opinion of the Underwriters, is material and is required to be stated therein or necessary to make the statements therein not misleading.

(e) On the Closing Date and on each Option Closing Date, as applicable, there shall have been furnished to the Representative, on behalf of the Underwriters, the written opinion and Rule 10b-5 negative assurance letter of Cooley LLP, counsel to the Company, dated the Closing Date or the Option Closing Date, as applicable, in form and substance reasonably satisfactory to the Representative and counsel to the Underwriters.

(f) On the Closing Date and on each Option Closing Date, as applicable, there shall have been furnished to the Representative, on behalf of the Underwriters, the written opinions of each of Knobbe Martens and Riverside Law LLP, intellectual property counsel to the Company dated the Closing Date or the Option Closing Date, as applicable, in form and substance reasonably satisfactory to the Representative and counsel to the Underwriters.

(g) On the Closing Date and on each Option Closing Date, as applicable, there shall have been furnished to the Representative the Rule 10b-5 negative assurance letter of Loeb

& Loeb LLP dated the Closing Date or the Option Closing Date, as applicable, and addressed to the Representative, in form and substance reasonably satisfactory to the Representative.

(h) The Representative shall have received a letter from Deloitte & Touche LLP, on the date hereof, on the Closing Date and on each Option Closing Date, as applicable, in form and substance reasonably satisfactory to the Representative, confirming that it is an independent registered public accounting firm within the meaning of the Securities Act and is in compliance with the applicable requirements relating to the qualifications of accountants under Rule 2-01 of Regulation S-X of the Commission, and confirming, as of the date of each such letter (or, with respect to matters involving changes or developments since the respective dates as of which specified financial information is given in the Registration Statement, the Time of Sale Disclosure Package and the Final Prospectus, as of a date not prior to the date hereof or more than five (5) days prior to the date of such letter), the conclusions and findings of said firm with respect to the financial information and other matters reasonably required by the Underwriters.

(i) The Company shall have furnished to the Representative a certificate of the Company, dated the Closing Date or the Option Closing Date, as applicable, signed by the Chief Executive Officer and the Chief Financial Officer of the Company, in their capacity as officers of the Company, to the effect that the signers of such certificate have carefully examined this Agreement, the Registration Statement, the Time of Sale Disclosure Package, the Final Prospectus and any supplements or amendments thereto and that:

(i) The representations and warranties of the Company that are qualified by materiality or by reference to any Material Adverse Effect in this Agreement are true and correct in all respects, and all other representations and warranties of the Company in this Agreement are true and correct in all material respects, as if made at and as of the Closing Date and on the Option Closing Date, as applicable. The Company has complied with all the agreements and satisfied all the conditions on its part required to be performed or satisfied at or prior to the Closing Date or the Option Closing Date, as applicable;

(ii) No stop order or other order (A) suspending the effectiveness of the Registration Statement or any part thereof or any amendment thereof, (B) suspending the qualification of the Public Securities for offering or sale, or (C) suspending or preventing the use of the Time of Sale Disclosure Package, the Final Prospectus or any Issuer Free Writing Prospectus, has been issued, and no proceeding for that purpose has been instituted or, to their knowledge, is contemplated by the Commission or any state or regulatory body;

(iii) There has been no occurrence of any event resulting, or reasonably likely to result, in a Material Adverse Effect during the period from and after the date of this Agreement and prior to the Closing Date or the Option Closing Date, as applicable.

(j) The Company shall have furnished to the Representative a certificate of the Company, dated the Closing Date or the Option Closing Date, as applicable, signed by the Secretary of the Company (the "Secretary's Certificate"), in his or her capacity as an officer of the Company certifying: (i) that each copy of the Company's certificate of incorporation and bylaws attached to the Secretary's Certificate is true, correct and complete, has not been modified and is in full force and effect; (ii) that a true, correct and complete copy of each of the

resolutions of the Company's board of directors and the resolutions of the pricing committee of the Company's board of directors relating to the approval of the offering is attached to the Secretary's Certificate and such resolutions are in full force and effect and have not been modified; and (iii) as to the incumbency of the officers of the Company.

(k) On or before the date hereof, the Representative shall have received duly executed Lock-Up Agreements executed by each of the Lock-Up Parties specified in Schedule V hereto. If the Representative, in its sole discretion, agrees to release or waive the restrictions set forth in the Lock-Up Agreement for an executive officer or director of the Company and provides the Company with notice of the impending release or waiver at least three (3) 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 at least two (2) business days before the effective date of the release or waiver.

(l) The Representative shall have received on and as of the Closing Date or the Option Closing Date, as applicable, satisfactory written evidence of the good standing of the Company and its subsidiaries from the applicable Secretary of State or other governing body of its jurisdiction of organization.

(m) The Representative shall have received the Underwriter Warrants.

(n) The Company shall have delivered to the Representative executed copies of the Warrant Agreement.

(o) The Company shall have furnished to the Underwriters and their counsel such additional documents, certificates and evidence as the Underwriters or their counsel may have reasonably requested.

If any condition specified in this Section 6 shall not have been fulfilled when and as required to be fulfilled, this Agreement may be terminated by the Representative by written notice to the Company at any time at or prior to the Closing Date or the Option Closing Date, as applicable, and such termination shall be without liability of any party to any other party, except that Section 5(h), Section 7 and Section 8 shall survive any such termination and remain in full force and effect.

7. Indemnification and Contribution.

(a) The Company agrees to indemnify, defend and hold harmless each Underwriter, its affiliates, directors and officers and employees, and each person, if any, who controls such Underwriter within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act (each, an "Indemnified Party"), from and against any losses, claims, damages or liabilities to which such Underwriter or such person may become subject, under the Securities Act or otherwise (including in settlement of any litigation if such settlement is effected with the written consent of the Company), insofar as such losses, claims, damages or liabilities (or actions in respect thereof) arise out of or are based upon (i) an untrue statement or alleged untrue statement of a material fact contained in the Registration Statement, including the information deemed to be a part of the Registration Statement at the Effective Time and at any

subsequent time pursuant to Rules 430A and 430B of the Rules and Regulations, or arise out of or are based upon the omission from the Registration Statement, or alleged omission to state therein, a material fact required to be stated therein or necessary to make the statements therein not misleading (ii) an untrue statement or alleged untrue statement of a material fact contained in the Time of Sale Disclosure Package, any Written Testing-the-Waters Communications, any Prospectus, or any amendment or supplement thereto, any Issuer Free Writing Prospectus, or the Marketing Materials or in any other materials used in connection with the offering of the Public Securities, or arise out of or are based upon the omission or alleged omission to state therein a material fact required to be stated therein or necessary to make the statements therein, in light of the circumstances under which they were made, not misleading, (iii) in whole or in part, any inaccuracy in the representations and warranties of the Company contained herein, or (iv) in whole or in part, any failure of the Company to perform its obligations hereunder or under law, and will reimburse such Indemnified Party for any legal or other expenses reasonably incurred by it in connection with evaluating, investigating or defending against such loss, claim, damage, liability or action; provided, however, that the Company shall not be liable in any such case to the extent that any such loss, claim, damage, liability or action arises out of or is based upon an untrue statement or alleged untrue statement or omission or alleged omission made in the Registration Statement, the Time of Sale Disclosure Package, any Written Testing-the-Waters Communications, any Prospectus, or any amendment or supplement thereto or any Issuer Free Writing Prospectus, in reliance upon and in conformity with the Underwriters' Information (as defined below).

(b) Each Underwriter, severally and not jointly, will indemnify, defend and hold harmless the Company, its affiliates, directors, officers and employees, and each person, if any, who controls the Company within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act (each, an "Underwriter Indemnified Party"), from and against any losses, claims, damages or liabilities to which the Company may become subject, under the Securities Act or otherwise (including in settlement of any litigation, if such settlement is effected with the written consent of such Underwriter), insofar as such losses, claims, damages or liabilities (or actions in respect thereof) arise out of or are based upon an untrue statement or alleged untrue statement of a material fact contained in the Registration Statement, the Time of Sale Disclosure Package, any Prospectus, or any amendment or supplement thereto or any Issuer Free Writing Prospectus or any Testing-the-Waters Communication, or arise out of or are based upon the omission or alleged omission to state therein a material fact required to be stated therein or necessary to make the statements therein not misleading, in each case to the extent, but only to the extent, that such untrue statement or alleged untrue statement or omission or alleged omission was made in the Registration Statement, the Time of Sale Disclosure Package, any Prospectus, or any amendment or supplement thereto, any Issuer Free Writing Prospectus or any Testing-the-Waters Communication, in reliance upon and in conformity with the Underwriters' Information (as defined below), and will reimburse such Underwriter Indemnified Party for any legal or other expenses reasonably incurred by it in connection with evaluating, investigating, and defending against any such loss, claim, damage, liability or action. The obligation of each Underwriter to indemnify the Underwriter Indemnified Party shall be limited to the amount of the underwriting discount applicable to the Public Securities to be purchased by such Underwriter hereunder actually received by such Underwriter.

(c) Promptly after receipt by an indemnified party under subsection (a) or (b) above of notice of the commencement of any action, such indemnified party shall, if a claim in respect thereof is to be made against the indemnifying party under such subsection, notify the indemnifying party in writing of the commencement thereof; but the failure to notify the indemnifying party shall not relieve the indemnifying party from any liability that it may have to any indemnified party except to the extent such indemnifying party has been materially prejudiced by such failure. In case any such action shall be brought against any indemnified party, and it shall notify the indemnifying party of the commencement thereof, the indemnifying party shall be entitled to participate in, and, to the extent that it shall wish, jointly with any other indemnifying party similarly notified, to assume the defense thereof, with counsel satisfactory to such indemnified party, and after notice from the indemnifying party to such indemnified party of the indemnifying party's election so to assume the defense thereof, the indemnifying party shall not be liable to such indemnified party under such subsection for any legal or other expenses subsequently incurred by such indemnified party in connection with the defense thereof; provided, however, that if (i) the indemnified party has reasonably concluded (based on advice of counsel) that there may be legal defenses available to it or other indemnified parties that are different from or in addition to those available to the indemnifying party, (ii) a conflict or potential conflict exists (based on advice of counsel to the indemnified party) between the indemnified party and the indemnifying party (in which case the indemnifying party will not have the right to direct the defense of such action on behalf of the indemnified party), or (iii) the indemnifying party has not in fact employed counsel reasonably satisfactory to the indemnified party to assume the defense of such action within a reasonable time after receiving notice of the commencement of the action, the indemnified party shall have the right to employ a single counsel to represent it in any claim in respect of which indemnity may be sought under subsection (a) or (b) of this Section 7, in which event the reasonable fees and expenses of such separate counsel shall be borne by the indemnifying party or parties and reimbursed to the indemnified party as incurred.

(d) The indemnifying party under this Section 7 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 against any loss, claim, damage, liability or expense by reason of such settlement or judgment. No indemnifying party shall, without the prior written consent of the indemnified party, effect any settlement, compromise or consent to the entry of judgment in any pending or threatened action, suit or proceeding in respect of which any indemnified party is a party or could be named and indemnity was or would be sought hereunder by such indemnified party, unless such settlement, compromise or consent (i) includes an unconditional release of such indemnified party from all liability for claims that are the subject matter of such action, suit or proceeding and (ii) does not include a statement as to or an admission of fault, culpability or a failure to act by or on behalf of any indemnified party.

(e) If the indemnification provided for in this Section 7 is unavailable or insufficient to hold harmless an indemnified party under subsection (a) or (b) above, then each indemnifying party shall contribute to the amount paid or payable by such indemnified party as a result of the losses, claims, damages or liabilities referred to in subsection (a) or (b) above, (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 from the offering and sale of the Public Securities or

(ii) if the allocation provided by clause (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 (i) above but also the relative fault of the Company on the one hand and the Underwriters on the other in connection with the statements or omissions 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 shall be deemed to be in the same proportion as the total net proceeds from the offering (before deducting expenses) received by the Company bear to the total underwriting discount received by the Underwriters, in each case as set forth in the table on the cover page of the Final Prospectus. The relative fault shall be determined by reference to, among other things, whether the untrue or alleged untrue statement of a material fact or the omission or alleged omission to state a material fact relates to information supplied by the Company or the Underwriters and the parties' relevant intent, knowledge, access to information and opportunity to correct or prevent such untrue statement or omission. The Company and the Underwriters agree that it would not be just and equitable if contributions pursuant to this subsection (e) were to be determined by pro rata allocation or by any other method of allocation that does not take account of the equitable considerations referred to in the first sentence of this subsection (e). The amount paid by an indemnified party as a result of the losses, claims, damages or liabilities referred to in the first sentence of this subsection (e) shall be deemed to include any legal or other expenses reasonably incurred by such indemnified party in connection with investigating or defending against any action or claim that is the subject of this subsection (e). Notwithstanding the provisions of this subsection (e), no Underwriter shall be required to contribute any amount in excess of the amount of the underwriting discount applicable to the Units to be purchased by such Underwriter hereunder actually received by such Underwriter. 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 Underwriters' respective obligations to contribute as provided in this Section 7 are several in proportion to their respective underwriting commitments and not joint.

(f) The obligations of the Company under this Section 7 shall be in addition to any liability that the Company may otherwise have and the benefits of such obligations shall extend, upon the same terms and conditions, to each Indemnified Party; and the obligations of each Underwriter under this Section 7 shall be in addition to any liability that each Underwriter may otherwise have and the benefits of such obligations shall extend, upon the same terms and conditions, to each Underwriter Indemnified Party.

(g) For purposes of this Agreement, each Underwriter severally confirms, and the Company acknowledges, that there is no information concerning such Underwriter furnished in writing to the Company by such Underwriter specifically for preparation of or inclusion in the Registration Statement, the Time of Sale Disclosure Package, any Prospectus or any Issuer Free Writing Prospectus, other than the Underwriters' Information. "Underwriters' Information" means the names of the Underwriters contained on the cover page of the Pricing Prospectus and the Final Prospectus and the following disclosure contained in the "Underwriting" section of the Final Prospectus: statements that relate to the amount of selling concession and re-allowance or to over-allotment and stabilization and related activities that may be undertaken by the Underwriters.

8. Representations and Agreements to Survive Delivery. The respective agreements, representations, warranties, indemnities and other statements of the Company or its officers and of the Underwriters set forth in or made pursuant to this Agreement will remain in full force and effect, regardless of any investigation made by or on behalf of the Underwriters or the Company or any of the affiliates, officers, directors, employees, or controlling persons of the Company or the Underwriters referred to in Section 7 hereof, and will survive delivery of and payment for the Shares and the Underwriter Warrants. The provisions of Sections 5(h), 7, 8 and 10 hereof shall survive the termination or cancellation of this Agreement.

9. Termination of this Agreement.

(a) The Representative shall have the right to terminate this Agreement by giving written notice to the Company as hereinafter specified at any time at or prior to the Closing Date or any Option Closing Date (as to the Option Units to be purchased on such Option Closing Date only), if in the sole discretion of the Representative, (i) there has occurred any material adverse change in the securities markets or any event, act or occurrence that has materially disrupted, or in the opinion of the Representative, will in the future materially disrupt, the securities markets or there shall be such a material adverse change in general financial, political or economic conditions or the effect of international conditions on the financial markets in the United States is such as to make it, in the judgment of the Representative, inadvisable or impracticable to market the Public Securities or enforce contracts for the sale of the Public Securities (ii) trading in the Common Stock shall have been suspended by the Commission or Nasdaq or trading in securities generally on the Nasdaq Stock Market, the NYSE or the NYSE MKT shall have been suspended or materially limited, (iii) minimum or maximum prices for trading shall have been fixed, or maximum ranges for prices for securities shall have been required, on the Nasdaq Stock Market, the NYSE or NYSE MKT, by such exchange or by order of the Commission or any other governmental authority having jurisdiction, (iv) a banking moratorium shall have been declared by United States federal or state authorities, (v) there shall have occurred any attack on, outbreak or escalation of hostilities or act of terrorism involving the United States, any declaration by the United States of a national emergency or war, any substantial change or development involving a prospective substantial change in United States or international political, financial or economic conditions or any other calamity or crisis, or (vi) in the judgment of the Representative, there has been, since the time of execution of this Agreement or since the respective dates as of which information is given in the Registration Statement, the Time of Sale Disclosure Package or the Final Prospectus, any material adverse change in the assets, properties, condition, financial or otherwise, or in the results of operations, business affairs or business prospects of the Company and its subsidiaries considered as a whole, whether or not arising in the ordinary course of business.

(b) The rights of termination contained in this Section 9 may be exercised by the Representative and are in addition to any other rights or remedies the Underwriters may have in respect of any default, act or failure to act or non-compliance by the Company in respect of any of the matters contemplated by this Agreement or otherwise. In the event of any such termination, there shall be no further liability on the part of the Underwriters to the Company or on the part of the Company to the Underwriters except in respect of any liability which may have arisen prior to or arise after such termination under Sections 5(h), 7, 8 and 10 hereof.

(c) In the event the offering and sale of the Public Securities hereunder is terminated by the Representative as provided in Section 9(a), the Underwriters will only be entitled to the reimbursement of reasonable out-of-pocket accountable expenses actually incurred in accordance with FINRA Rule 5110(f)(2)(D).

(d) If the Representative elects to terminate this Agreement as provided in this Section 9, the Company and the other Underwriters shall be notified promptly by the Representative by telephone, confirmed by letter.

10. Substitution of Underwriters. (a) If any Underwriter or Underwriters shall default in its or their obligations to purchase Units hereunder on the Closing Date or any Option Closing Date, as applicable, and the aggregate number of Units which such defaulting Underwriter or Underwriters agreed but failed to purchase does not exceed ten percent (10%) of the total number of Units to be purchased by all Underwriters on such Closing Date or Option Closing Date, the other Underwriters shall be obligated severally, in proportion to their respective commitments hereunder, to purchase the Units which such defaulting Underwriter or Underwriters agreed but failed to purchase on such Closing Date or Option Closing Date. If any Underwriter or Underwriters shall so default and the aggregate number of Units with respect to which such default or defaults occur is more than ten percent (10%) of the total number of Units to be purchased by all Underwriters on such Closing Date or Option Closing Date and arrangements satisfactory to the remaining Underwriters and the Company for the purchase of such Units by other persons are not made within forty-eight (48) hours after such default, this Agreement shall terminate.

(b) If the remaining Underwriters or substituted Underwriters are required hereby or agree to take up all or part of the Units of a defaulting Underwriter or Underwriters on such Closing Date or Option Closing Date as provided in this Section 10, (i) the Company shall have the right to postpone such Closing Date or Option Closing Date for a period of not more than five (5) full business days in order to permit the Company to effect whatever changes in the Registration Statement, the Final Prospectus, or in any other documents or arrangements, which may thereby be made necessary, and the Company agrees to promptly file any amendments to the Registration Statement or the Final Prospectus which may thereby be made necessary, and (ii) the respective numbers of Units to be purchased by the remaining Underwriters or substituted Underwriters shall be taken as the basis of their underwriting obligation for all purposes of this Agreement. Nothing herein contained shall relieve any defaulting Underwriter of its liability to the Company or any other Underwriter for damages occasioned by its default hereunder. Any termination of this Agreement pursuant to this Section 10 shall be without liability on the part of any non-defaulting Underwriters or the Company, except that the representations, warranties, covenants, indemnities, agreements and other statements set forth in Sections 2, 3, 5(h), 7, 8 and 9 through 17, inclusive, shall not terminate and shall remain in full force and effect; provided, however, that nothing in this Agreement shall relieve a defaulting Underwriter of its liability, if any, to the Company for damages occasioned by its default hereunder.

11. Notices. Except as otherwise provided herein, all communications hereunder shall be in writing and shall be mailed, delivered or faxed to:

If to the Underwriters, to:

Roth Capital Partners, LLC
57 West 57th Street 18th Floor
New York, NY 10019
Attention: Eric Cheng, Managing Director
Fax:

With a copy to:

Loeb & Loeb LLP
345 Park Avenue
New York, NY 10154
Attention: Mitchell Nussbaum, Esq.
Fax: (212) 407-4990

If to the Company, to:

Bionano Genomics, Inc.
9640 Towne Centre Drive, Suite 100
San Diego, CA 92121
Attention: R. Erik Holmlin, President and Chief Executive Officer
Fax:

With a copy to:

Cooley LLP
4401 Eastgate Mall
San Diego, CA 92121
Attention: Thomas Coll, Esq.
Fax:

or in each case to such other address as the person to be notified may have requested in writing. Any party to this Agreement may change such address for notices by sending to the other parties to this Agreement written notice of a new address for such purpose.

12. Persons Entitled to Benefit of Agreement. This Agreement shall inure to the benefit of and be binding upon the parties hereto and their respective successors and assigns and the controlling persons, officers and directors referred to in Section 7. Nothing in this Agreement is intended or shall be construed to give to any other person, firm or corporation any legal or equitable remedy or claim under or in respect of this Agreement or any provision herein contained. The term “successors and assigns” as herein used shall not include any purchaser, as such purchaser, of any of the Units from any Underwriters.

13. Absence of Fiduciary Relationship. The Company acknowledges and agrees that: (a) each Underwriter has been retained solely to act as underwriter in connection with the sale of the Public Securities and that no fiduciary, advisory or agency relationship between the Company and any Underwriter has been created in respect of any of the transactions contemplated by this Agreement, irrespective of whether the Underwriter has advised or is advising the Company on other matters; (b) the price and other terms of the Public Securities set

forth in this Agreement were established by the Company following discussions and arms-length negotiations with the Underwriters and the Company is capable of evaluating and understanding and understands and accepts the terms, risks and conditions of the transactions contemplated by this Agreement; (c) it has been advised that the Underwriters and their affiliates are engaged in a broad range of transactions that may involve interests that differ from those of the Company and that no Underwriter has any obligation to disclose such interest and transactions to the Company by virtue of any fiduciary, advisory or agency relationship; and (d) it has been advised that each Underwriter is acting, in respect of the transactions contemplated by this Agreement, solely for the benefit of such Underwriter, and not on behalf of the Company.

14. Amendments and Waivers. No supplement, modification or waiver of this Agreement shall be binding unless executed in writing by the party to be bound thereby. The failure of a party to exercise any right or remedy shall not be deemed or constitute a waiver of such right or remedy in the future. No waiver of any of the provisions of this Agreement shall be deemed or shall constitute a waiver of any other provision hereof (regardless of whether similar), nor shall any such waiver be deemed or constitute a continuing waiver unless otherwise expressly provided.

15. Partial Unenforceability. The invalidity or unenforceability of any section, paragraph, clause or provision of this Agreement shall not affect the validity or enforceability of any other section, paragraph, clause or provision.

16. Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of New York.

17. Submission to Jurisdiction. The Company irrevocably (a) submits to the jurisdiction of any court of the State of New York for the purpose of any suit, action, or other proceeding arising out of this Agreement, or any of the agreements or transactions contemplated by this Agreement, the Registration Statement, the Time of Sale Disclosure Package, and any Prospectus (each a "Proceeding"), (b) agrees that all claims in respect of any Proceeding may be heard and determined in any such court, (c) waives, to the fullest extent permitted by law, any immunity from jurisdiction of any such court or from any legal process therein, (d) agrees not to commence any Proceeding other than in such courts, and (e) waives, to the fullest extent permitted by law, any claim that such Proceeding is brought in an inconvenient forum. THE COMPANY (ON BEHALF OF ITSELF AND, TO THE FULLEST EXTENT PERMITTED BY LAW, ON BEHALF OF ITS RESPECTIVE EQUITY HOLDERS AND CREDITORS) HEREBY WAIVES ANY RIGHT IT MAY HAVE TO A TRIAL BY JURY IN RESPECT OF ANY CLAIM BASED UPON, ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT AND THE TRANSACTIONS CONTEMPLATED BY THIS AGREEMENT, THE REGISTRATION STATEMENT, THE TIME OF SALE DISCLOSURE PACKAGE AND ANY PROSPECTUS.

18. Counterparts. This Agreement may be executed and delivered (including by facsimile transmission or electronic mail) in one or more counterparts and, if executed in more than one counterpart, the executed counterparts shall each be deemed to be an original and all such counterparts shall together constitute one and the same instrument.

19. Definitions. For purposes of this Agreement, (a) except where otherwise expressly provided, the term "affiliate" has the meaning set forth in Rule 405 under the Securities Act; (b) the term "business day" means any day other than a day on which banks are permitted or required to be closed in New York City; (c) the term "subsidiary" has the meaning set forth in Rule 405 under the Securities Act; and (d) the term "significant subsidiary" has the meaning set forth in Rule 1-02 of Regulation S-X under the Exchange Act. In the event that the Company has only one subsidiary, then all references herein to "subsidiaries" of the Company shall be deemed to refer to such single subsidiary, mutatis mutandis.

[Signature Page Follows]

Please sign and return to the Company the enclosed duplicates of this letter whereupon this letter will become a binding agreement between the Company and the several Underwriters in accordance with its terms.

Very truly yours,

BIONANO GENOMICS, INC.

By: _____
Name: _____
Title: _____

Confirmed as of the date first above-mentioned by the
Representative of the several Underwriters

ROTH CAPITAL PARTNERS, LLC

By: _____
Name: _____
Title: _____

[Signature page to Underwriting Agreement]

SCHEDULE I

Name	Number of Firm Units to be Purchased	Number of Option Units to be Purchased
Roth Capital Partners, LLC		
Maxim Group LLP		
LifeSci Capital LLC		
Total		

SCHEDULE II

PRICING INFORMATION

Issuer:	Bionano Genomics, Inc. (the "Company")
Nasdaq Symbols:	"BNGO" (Common Stock); "BNGOU" (Units); "BNGOW" (Warrants)
Securities:	[·] units ("Units"), each Unit consisting of one share of common stock, par value $0.0001 per share, of the Company (the "Common Stock"), and one warrant to purchase one share of Common Stock (the "Warrants").
Over-allotment option:	Up to an additional [·] Units at a price of $[·] per Unit.
Public offering price:	$[·] per Unit
Underwriting discount:	$[·] per Unit
Expected net proceeds:	Approximately $[·] million ($[·] if the overallotment option is exercised in full) (after deducting the underwriting discount and estimated offering expenses payable by the Company).
Trade date:	[·], 2018
Settlement date:	[·], 2018
Underwriters:	Roth Capital Partners, LLC Maxim Group LLP LifeSci Capital LLC

SCHEDULE III

FREE WRITING PROSPECTUS

SCHEDULE IV

WRITTEN TESTING-THE-WATERS COMMUNICATIONS

SCHEDULE V

Lock-Up Parties

EXHIBIT A

Form of Lock-Up Agreement

EXHIBIT B

Form of Press Release

Bionano Genomics, Inc.

[Date]

Bionano Genomics, Inc. (the "Company") announced today that Roth Capital Partners, LLC, the Representative in the Company's recent public sale of units to purchase shares of the Company's common stock and warrants to purchase shares of the Company's common stock, is [waiving][releasing] a lock-up restriction with respect to shares of the Company's common stock held by [certain officers, directors] [an officer, director] of the Company. The [waiver][release] will take effect on , 20 , and the shares of common stock 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.

EXHIBIT C

Form of Underwriter Warrant

EXHIBIT C

Form of Underwriter Warrant

NEITHER THESE SECURITIES NOR THE SECURITIES ISSUABLE UPON EXERCISE OF THESE SECURITIES HAVE BEEN REGISTERED WITH THE SECURITIES AND EXCHANGE COMMISSION OR THE SECURITIES COMMISSION OF ANY STATE IN RELIANCE UPON AN EXEMPTION FROM REGISTRATION UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "SECURITIES ACT"), AND, ACCORDINGLY, MAY NOT BE OFFERED OR SOLD EXCEPT PURSUANT TO AN EFFECTIVE REGISTRATION STATEMENT UNDER THE SECURITIES ACT OR PURSUANT TO AN AVAILABLE EXEMPTION FROM, OR IN A TRANSACTION NOT SUBJECT TO, THE REGISTRATION REQUIREMENTS OF THE SECURITIES ACT AND IN ACCORDANCE WITH APPLICABLE STATE SECURITIES LAWS AS EVIDENCED BY A LEGAL OPINION OF COUNSEL TO THE TRANSFEROR TO SUCH EFFECT, THE SUBSTANCE OF WHICH SHALL BE REASONABLY ACCEPTABLE TO THE COMPANY. THESE SECURITIES AND THE SECURITIES ISSUABLE UPON EXERCISE OF THESE SECURITIES MAY BE PLEDGED IN CONNECTION WITH A BONA FIDE MARGIN ACCOUNT SECURED BY SUCH SECURITIES.

BIONANO GENOMICS, INC.

FORM OF UNDERWRITER WARRANT

Warrant No. [ ] Original Issue Date: , 2018

Bionano Genomics, Inc., a Delaware corporation (the "Company"), hereby certifies that, as partial compensation for services, Roth Capital Partners LLC or its registered assigns (the "Holder"), is entitled to purchase from the Company up to a total of [ ] shares of Common Stock (each such share, a "Warrant Share" and all such shares, the "Warrant Shares"), at any time and from time to time beginning on , 2019 [Insert the date which is the first anniversary of the Effective Date] and through and including 6:30pm New York City time on , 2023 [Insert the date which is the fifth anniversary of the Effective Date] (the "Expiration Date"):

1. Definitions. As used in this Warrant, the following terms shall have the respective definitions set forth in this Section 1.

"**Affiliate**" means any Person that, directly or indirectly through one or more intermediaries, controls or is controlled by or is under common control with a Person, as such terms are used in and construed under Rule 144.

"**Business Day**" means any day except Saturday, Sunday and any day which is a federal legal holiday or a day on which banking institutions in the State of New York are authorized or required by law or other governmental action to close.

"**Common Stock**" means the common stock of the Company, $0.0001 par value per share, and any securities into which such common stock may hereafter be reclassified or for which it may be exchanged as a class.

"**Effective Date**" means the effective date of the Registration Statement on Form S-1 (Registration No. 333-225970).

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

"**Exercise Price**" means $[Insert 150% of price to public in IPO], subject to adjustment in accordance with Section 9.

"**Fundamental Transaction**" means any of the following: (1) the Company effects any merger or consolidation of the Company with or into another Person, (2) the Company effects any sale of all or substantially all of its assets in one or a series of related transactions, (3) any tender offer or exchange offer (whether by the Company or another Person) is completed pursuant to which holders of Common Stock are permitted to tender or exchange their shares for other securities, cash or property, or (4) the Company effects any reclassification of the Common Stock or any compulsory share exchange pursuant to which the Common Stock is effectively converted into or exchanged for other securities, cash or property.

"**New York Courts**" means the state and federal courts sitting in the City of New York, Borough of Manhattan.

"**Original Issue Date**" means the Original Issue Date first set forth on the first page of this Warrant.

"**Person**" means an individual or corporation, partnership, trust, incorporated or unincorporated association, joint venture, limited liability company, joint stock company, government (or an agency or subdivision thereof) or other entity of any kind.

"**Rule 144**" means Rule 144 promulgated by the SEC pursuant to the Securities Act, as such Rule may be amended from time to time, or any similar rule or regulation hereafter adopted by the SEC on having substantially the same effect as such Rule.

"**SEC**" means the Securities and Exchange Commission.

"**Securities Act**" means the Securities Act of 1933, as amended.

"**Subsidiary**" means any "significant subsidiary" as defined in Rule 1-02(w) of Regulation S-X promulgated by the SEC under the Exchange Act.

"**Trading Day**" means (i) a day on which the Common Stock is traded or quoted on a Trading Market, or (ii) if the Common Stock is not traded or quoted on any Trading Market, a

day on which the Common Stock is quoted in the over-the-counter market as reported by the Pink Sheets LLC (or any similar organization or agency succeeding to its functions of reporting prices); provided, that in the event that the Common Stock is not traded or quoted as set forth in (i) or (ii) hereof, then Trading Day shall mean a Business Day.

"**Trading Market**" means whichever of the New York Stock Exchange, NYSE American, the NASDAQ Capital Market, the NASDAQ Global Market, the NASDAQ Global Select Market or OTC Bulletin Board on which the Common Stock is listed or quoted for trading on the date in question.

"**Warrant Shares**" means the shares of Common Stock issuable upon exercise of this Warrant.

2. Registration of Warrant. The Company shall register this Warrant upon records to be maintained by the Company for that purpose (the "Warrant Register"), in the name of the record Holder hereof from time to time. The Company may deem and treat the registered Holder of this Warrant as the absolute owner hereof for the purpose of any exercise hereof or any distribution to the Holder, and for all other purposes, absent actual notice to the contrary.

3. Registration of Transfers. Subject to the limitation set forth in the last sentence of Section 4 hereof, the Company shall register the transfer of any portion of this Warrant in the Warrant Register, upon surrender of this Warrant, with the Form of Assignment attached hereto duly completed and signed, to the Company at its address specified herein. Upon any such registration or transfer, a new Warrant to purchase Common Stock, in substantially the form of this Warrant (any such new Warrant, a "New Warrant"), evidencing the portion of this Warrant so transferred shall be issued to the transferee and a New Warrant evidencing the remaining portion of this Warrant not so transferred, if any, shall be issued to the transferring Holder. The acceptance of the New Warrant by the transferee thereof shall be deemed the acceptance by such transferee of all of the rights and obligations of a holder of a Warrant.

4. Exercise and Duration of Warrants. This Warrant shall be exercisable by the registered Holder at any time and from time to time beginning on , 2019 [Insert date that is the first anniversary of the Effective Date] through and including the Expiration Date. At 6:30 p.m., New York City time on the Expiration Date which, in accordance with FINRA Rule 5110(f)(2)(G)(i) shall not be more than five (5) years from the Effective Date, the portion of this Warrant not exercised prior thereto shall be and become void and of no value. The Company may not call or redeem any portion of this Warrant without the prior written consent of the affected Holder. This Warrant shall not be sold, transferred, assigned, pledged, or hypothecated, or be the subject of any hedging, short sale, derivative, put, or call transaction that would result in the effective economic disposition of this Warrant by any person for a period of 180 days from the Effective Date, except as provided in FINRA Rule 5110(g)(2).

5. Delivery of Warrant Shares.

(a) To effect exercises hereunder, the Holder shall not be required to physically surrender this Warrant unless the aggregate Warrant Shares represented by this Warrant is being exercised. Upon delivery of the Exercise Notice (in the form attached hereto) to

the Company (with the attached Warrant Shares Exercise Log) at its address for notice set forth herein and upon payment of the Exercise Price multiplied by the number of Warrant Shares that the Holder intends to purchase hereunder (provided, that, in lieu of the payment of the Exercise Price, the Holder may have notified the Company in its Exercise Notice that such exercise was made pursuant to a Cashless Exercise (as defined in Section 11 hereof)), the Company shall promptly (but in no event later than five Trading Days) after the Date of Exercise (as defined herein)) issue and deliver to the Holder, a certificate for the Warrant Shares issuable upon such exercise. The Company shall, upon request of the Holder and subsequent to the date on which a registration statement covering the resale of the Warrant Shares, if any, has been declared effective by the SEC, use its reasonable best efforts to deliver Warrant Shares hereunder electronically through the Depository Trust Corporation or another established clearing corporation performing similar functions, if available, provided, that, the Company may, but will not be required to change its transfer agent if its current transfer agent cannot deliver Warrant Shares electronically through the Depository Trust Corporation. A "Date of Exercise" means the date on which the Holder shall have delivered to the Company: (i) the Exercise Notice (with the Warrant Exercise Log attached to it), appropriately completed and duly signed and (ii) payment of the Exercise Price for the number of Warrant Shares so indicated by the Holder to be purchased.

(b) If by the fifth Trading Day after a Date of Exercise the Company fails to deliver the required number of Warrant Shares in the manner required pursuant to Section 5(a), then the Holder will have the right to rescind such exercise.

(c) The Company's obligations to issue and deliver Warrant Shares in accordance with the terms hereof are absolute and unconditional, irrespective of any action or inaction by the Holder to enforce the same, any waiver or consent with respect to any provision hereof, the recovery of any judgment against any Person or any action to enforce the same, or any setoff, counterclaim, recoupment, limitation or termination, or any breach or alleged breach by the Holder or any other Person of any obligation to the Company or any violation or alleged violation of law by the Holder or any other Person, and irrespective of any other circumstance which might otherwise limit such obligation of the Company to the Holder in connection with the issuance of Warrant Shares. Nothing herein shall limit a Holder's right to pursue any other remedies available to it hereunder, at law or in equity including, without limitation, a decree of specific performance and/or injunctive relief with respect to the Company's failure to timely deliver certificates representing Warrant Shares upon exercise of the Warrant as required pursuant to the terms hereof.

6. Charges, Taxes and Expenses. Issuance and delivery of Warrant Shares upon exercise of this Warrant shall be made without charge to the Holder for any issue or transfer tax, withholding tax, transfer agent fee or other incidental tax or expense in respect of the issuance of such certificates, all of which taxes and expenses shall be paid by the Company; provided, however, that the Company shall not be required to pay any tax which may be payable in respect of any transfer involved in the registration of any certificates for Warrant Shares or Warrants in a name other than that of the Holder. The Holder shall be responsible for all other tax liability that may arise as a result of holding or transferring this Warrant or receiving Warrant Shares upon exercise hereof.

7. Replacement of Warrant. If this Warrant is mutilated, lost, stolen or destroyed, the Company shall issue or cause to be issued in exchange and substitution for and upon cancellation hereof, or in lieu of and substitution for this Warrant, a New Warrant, but only upon receipt of evidence reasonably satisfactory to the Company of such loss, theft or destruction and customary and reasonable indemnity (which shall not include a surety bond), if requested. Applicants for a New Warrant under such circumstances shall also comply with such other reasonable regulations and procedures and pay such other reasonable third-party costs as the Company may prescribe. If a New Warrant is requested as a result of a mutilation of this Warrant, then the Holder shall deliver such mutilated Warrant to the Company as a condition precedent to the Company's obligation to issue the New Warrant.

8. Reservation of Warrant Shares. The Company covenants that it will at all times reserve and keep available out of the aggregate of its authorized but unissued and otherwise unreserved Common Stock, solely for the purpose of enabling it to issue Warrant Shares upon exercise of this Warrant as herein provided, the number of Warrant Shares which are then issuable and deliverable upon the exercise of this entire Warrant, free from preemptive rights or any other contingent purchase rights of Persons other than the Holder (taking into account the adjustments and restrictions of Section 9). The Company covenants that all Warrant Shares so issuable and deliverable shall, upon issuance and the payment of the applicable Exercise Price in accordance with the terms hereof, be duly and validly authorized, issued and fully paid and nonassessable.

9. Certain Adjustments. The Exercise Price and number of Warrant Shares issuable upon exercise of this Warrant are subject to adjustment from time to time as set forth in this Section 9.

(a) Stock Dividends and Splits. If the Company, at any time while this Warrant is outstanding, (i) pays a stock dividend on its Common Stock or otherwise makes a distribution on any class of capital stock that is payable in shares of Common Stock, (ii) subdivides outstanding shares of Common Stock into a larger number of shares, or (iii) combines outstanding shares of Common Stock into a smaller number of shares, then in each such case the Exercise Price shall be multiplied by a fraction of which the numerator shall be the number of shares of Common Stock outstanding immediately before such event and of which the denominator shall be the number of shares of Common Stock outstanding immediately after such event. Any adjustment made pursuant to clause (i) of this paragraph shall become effective immediately after the record date for the determination of stockholders entitled to receive such dividend or distribution, and any adjustment pursuant to clause (ii) or (iii) of this paragraph shall become effective immediately after the effective date of such subdivision or combination.

(b) Fundamental Transactions. If, at any time while this Warrant is outstanding there is a Fundamental Transaction, then the Holder shall have the right thereafter to receive, upon exercise of this Warrant, the same amount and kind of securities, cash or property as it would have been entitled to receive upon the occurrence of such Fundamental Transaction if it had been, immediately prior to such Fundamental Transaction, the holder of the number of Warrant Shares then issuable upon exercise in full of this Warrant (the "Alternate Consideration"). For purposes of any such exercise, the determination of the Exercise Price shall be appropriately adjusted to apply to such Alternate Consideration based on the amount of

Alternate Consideration issuable in respect of one share of Common Stock in such Fundamental Transaction, and the Company shall apportion the Exercise Price among the Alternate Consideration in a reasonable manner reflecting the relative value of any different components of the Alternate Consideration. If holders of Common Stock are given any choice as to the securities, cash or property to be received in a Fundamental Transaction, then the Holder shall be given the same choice as to the Alternate Consideration it receives upon any exercise of this Warrant following such Fundamental Transaction. At the Holder's option and request, any successor to the Company or surviving entity in such Fundamental Transaction shall issue to the Holder a new warrant substantially in the form of this Warrant and consistent with the foregoing provisions and evidencing the Holder's right to purchase the Alternate Consideration for the aggregate Exercise Price upon exercise thereof. The terms of any agreement pursuant to which a Fundamental Transaction is effected shall include terms requiring any such successor or surviving entity to comply with the provisions of this paragraph (b) and insuring that the Warrant (or any such replacement security) will be similarly adjusted upon any subsequent transaction analogous to a Fundamental Transaction.

(c) Number of Warrant Shares. Simultaneously with any adjustment to the Exercise Price pursuant to this Section 9, the number of Warrant Shares that may be purchased upon exercise of this Warrant shall be increased or decreased proportionately, so that after such adjustment the aggregate Exercise Price payable hereunder for the adjusted number of Warrant Shares shall be the same as the aggregate Exercise Price in effect immediately prior to such adjustment.

(d) Calculations. All calculations under this Section 9 shall be made to the nearest cent or the nearest 1/100th of a share, as applicable. The number of shares of Common Stock outstanding at any given time shall not include shares owned or held by or for the account of the Company, and the disposition of any such shares shall be considered an issue or sale of Common Stock.

(e) Notice of Adjustments. Upon the occurrence of each adjustment pursuant to this Section 9, the Company at its expense will promptly compute such adjustment in accordance with the terms of this Warrant and prepare a certificate setting forth such adjustment, including a statement of the adjusted Exercise Price and adjusted number or type of Warrant Shares or other securities issuable upon exercise of this Warrant (as applicable), describing the transactions giving rise to such adjustments and showing in detail the facts upon which such adjustment is based. Upon written request, the Company will promptly deliver a copy of each such certificate to the Holder and to the Company's Transfer Agent.

(f) Notice of Corporate Events. If the Company (i) declares a dividend or any other distribution of cash, securities or other property in respect of its Common Stock, including without limitation any granting of rights or warrants to subscribe for or purchase any capital stock of the Company or any Subsidiary, (ii) authorizes or approves, enters into any agreement contemplating or solicits stockholder approval for any Fundamental Transaction or (iii) authorizes the voluntary dissolution, liquidation or winding up of the affairs of the Company, then the Company shall deliver to the Holder a notice describing the material terms and conditions of such transaction (but only to the extent such disclosure would not result in the dissemination of material, non-public information to the Holder) at least 10 calendar days prior

to the applicable record or effective date on which a Person would need to hold Common Stock in order to participate in or vote with respect to such transaction, and the Company will take all steps reasonably necessary in order to give the Holder the practical opportunity to exercise this Warrant prior to such time so as to participate in or vote with respect to such transaction; provided, however, that the failure to deliver such notice or any defect therein shall not affect the validity of the corporate action required to be described in such notice.

10. Payment of Exercise Price. The Holder shall pay the Exercise Price by delivering immediately available funds if the Holder did not notify the Company in the Exercise Notice that the exercise was made pursuant to a Cashless Exercise as further described in Section 11 hereof.

11. Cashless Exercise. Notwithstanding anything contained herein to the contrary (other than Section 12 below), the Holder may, in lieu of making the cash payment otherwise contemplated to be made to the Company upon exercise, elect instead to receive upon such exercise the "Net Number" of shares of Common Stock determined according to the following formula (a "Cashless Exercise"):

$$\text{Net Number} = \frac{(A \times B) - (A \times C)}{B}$$

For purposes of the foregoing formula:

A = the total number of shares with respect to which this Warrant is then being exercised.

B = as applicable: (i) the closing sale price of the Common Stock on the Trading Day immediately preceding the date of the applicable Exercise Notice if such Exercise Notice is (1) both executed and delivered pursuant to Section 5 hereof on a day that is not a Trading Day or (2) both executed and delivered pursuant to Section 5 hereof on a Trading Day prior to the opening of "regular trading hours" (as defined in Rule 600(b)(64) of Regulation NMS promulgated under the federal securities laws) on such Trading Day, (ii) the bid price of the Common Stock as of the time of the Holder's execution of the applicable Exercise Notice if such Exercise Notice is executed during "regular trading hours" on a Trading Day pursuant to Section 5 hereof, (iii) the closing sale price of the Common Stock on the date of the applicable Exercise Notice if the date of such Exercise Notice is a Trading Day and such Exercise Notice is both executed and delivered pursuant to Section 5 hereof after the close of "regular trading hours" on such Trading Day, or (iv) if the Common Stock is not traded in such manner that the quotations referred to above are available, the fair value per share of the Common Stock as determined by the Board of Directors of the Company in good faith.

C = the Exercise Price then in effect for the applicable Warrant Shares at the time of such exercise.

12. Limitations on Exercise. Notwithstanding anything to the contrary contained herein, the number of Warrant Shares that may be acquired by the Holder upon any exercise of this Warrant (or otherwise in respect hereof) shall be limited to the extent necessary to insure that, following such exercise (or other issuance), the total number of shares of Common Stock then beneficially owned by such Holder and its Affiliates and any other Persons whose beneficial

ownership of Common Stock would be aggregated with the Holder's for purposes of Section 13(d) of the Exchange Act, does not exceed 9.99% of the total number of issued and outstanding shares of Common Stock (including for such purpose the shares of Common Stock issuable upon such exercise). For such purposes, beneficial ownership shall be determined in accordance with Section 13(d) of the Exchange Act and the rules and regulations promulgated thereunder. This provision shall not restrict the number of shares of Common Stock which a Holder may receive or beneficially own in order to determine the amount of securities or other consideration that such Holder may receive in the event of a Fundamental Transaction as contemplated in Section 9 of this Warrant. This restriction may not be waived. Notwithstanding anything to the contrary contained in this Warrant, (a) no term of this Section may be waived by any party, nor amended such that the threshold percentage of ownership would be directly or indirectly increased, (b) this restriction runs with the Warrant and may not be modified or waived by any subsequent holder hereof and (c) any attempted waiver, modification or amendment of this Section will be void ab initio.

13. No Fractional Shares. No fractional shares of Common Stock will be issued in connection with any exercise of this Warrant. In lieu of any fractional shares which would, otherwise be issuable, the Company shall pay cash equal to the product of such fraction multiplied by the closing price of one Warrant Share as reported by the applicable Trading Market on the date of exercise.

14. Notices. Any and all notices or other communications or deliveries hereunder (including, without limitation, any Exercise Notice) shall be in writing and shall be deemed given and effective on the earliest of (i) the date of transmission, if such notice or communication is delivered via facsimile at the facsimile number specified in this Section prior to 6:30 p.m. (New York City time) on a Trading Day, (ii) the next Trading Day after the date of transmission, if such notice or communication is delivered via facsimile at the facsimile number specified in this Section on a day that is not a Trading Day or later than 6:30 p.m. (New York City time) on any Trading Day, (iii) the Trading Day following the date of mailing, if sent by nationally recognized overnight courier service, or (iv) upon actual receipt by the party to whom such notice is required to be given. The addresses for such communications shall be: (i) if to the Company, to 9640 Towne Centre Drive, Suite 100, San Diego, CA 92121, Attn: Chief Financial Officer, or to Facsimile No.: (or such other address as the Company shall indicate in writing in accordance with this Section), or (ii) if to the Holder, to the address or facsimile number appearing on the Warrant Register or such other address or facsimile number as the Holder may provide to the Company in accordance with this Section.

15. Warrant Agent. The Company shall serve as warrant agent under this Warrant. Upon 10 days' notice to the Holder, the Company may appoint a new warrant agent. Any corporation into which the Company or any new warrant agent may be merged or any corporation resulting from any consolidation to which the Company or any new warrant agent shall be a party or any corporation to which the Company or any new warrant agent transfers substantially all of its corporate trust or shareholders services business shall be a successor warrant agent under this Warrant without any further act. Any such successor warrant agent shall promptly cause notice of its succession as warrant agent to be mailed (by first class mail, postage prepaid) to the Holder at the Holder's last address as shown on the Warrant Register.

16. Miscellaneous.

(g) This Warrant shall be binding on and inure to the benefit of the parties hereto and their respective successors and assigns. Subject to the preceding sentence, nothing in this Warrant shall be construed to give to any Person other than the Company and the Holder any legal or equitable right, remedy or cause of action under this Warrant. This Warrant may be amended only in writing signed by the Company and the Holder or, if applicable, their respective successors and assigns.

(h) All questions concerning the construction, validity, enforcement and interpretation of this Warrant shall be governed by and construed and enforced in accordance with the internal laws of the State of New York, without regard to the principles of conflicts of law thereof. Each party agrees that all legal proceedings concerning the interpretations, enforcement and defense of this Warrant and the transactions herein contemplated ("Proceedings") (whether brought against a party hereto or its respective Affiliates, employees or agents) shall be commenced exclusively in the New York Courts. Each party hereto hereby irrevocably submits to the exclusive jurisdiction of the New York Courts for the adjudication of any dispute hereunder or in connection herewith or with any transaction contemplated hereby or discussed herein, and hereby irrevocably waives, and agrees not to assert in any Proceeding, any claim that it is not personally subject to the jurisdiction of any New York Court, or that such Proceeding has been commenced in an improper or inconvenient forum. Each party hereto hereby irrevocably waives personal service of process and consents to process being served in any such Proceeding by mailing a copy thereof via registered or certified mail or overnight delivery (with evidence of delivery) to such party at the address in effect for notices to it under this Warrant and agrees that such service shall constitute good and sufficient service of process and notice thereof. Nothing contained herein shall be deemed to limit in any way any right to serve process in any manner permitted by law. Each party hereto hereby irrevocably waives, to the fullest extent permitted by applicable law, any and all right to trial by jury in any legal proceeding arising out of or relating to this Warrant or the transactions contemplated hereby. If either party shall commence a Proceeding to enforce any provisions of this Warrant, then the prevailing party in such Proceeding shall be reimbursed by the other party for its attorney's fees and other costs and expenses incurred with the investigation, preparation and prosecution of such Proceeding.

(i) The headings herein are for convenience only, do not constitute a part of this Warrant and shall not be deemed to limit or affect any of the provisions hereof.

(j) In case any one or more of the provisions of this Warrant shall be invalid or unenforceable in any respect, the validity and enforceability of the remaining terms and provisions of this Warrant shall not in any way be affected or impaired thereby and the parties will attempt in good faith to agree upon a valid and enforceable provision which shall be a commercially reasonable substitute therefor, and upon so agreeing, shall incorporate such substitute provision in this Warrant.

(k) Prior to exercise of this Warrant, the Holder hereof shall not, by reason of being a Holder, be entitled to any rights of a stockholder with respect to the Warrant Shares.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK,

SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the Company has caused this Warrant to be duly executed by its authorized officer as of the date first indicated above.

BIONANO GENOMICS, INC.

By _____
Name:
Title:

[Signature Page to Warrant]

EXERCISE NOTICE
BIONANO GENOMICS, INC.
WARRANT DATED

The undersigned Holder hereby irrevocably elects to purchase shares of Common Stock pursuant to the above referenced Warrant. Capitalized terms used herein and not otherwise defined have the respective meanings set forth in the Warrant.

(1) The undersigned Holder hereby exercises its right to purchase Warrant Shares pursuant to the Warrant.

(2) The holder intends that payment of the Exercise Price shall be made as:

a "Cash Exercise" with respect to Warrant Shares; and/or

a "Cashless Exercise" with respect to Warrant Shares.

(3) Pursuant to this Exercise Notice, the Company shall deliver to the holder Warrant Shares in accordance with the terms of the Warrant.

(4) By its delivery of this Exercise Notice, the undersigned represents and warrants to the Company that in giving effect to the exercise evidenced hereby the Holder will not beneficially own in excess of the number of shares of Common Stock (determined in accordance with Section 13(d) of the Securities Exchange Act of 1934) permitted to be owned under Section 12 of this Warrant to which this notice relates.

Dated: _____, _____

Name of Holder:

(Print) _____

By: _____
Name
Title

(Signature must conform in all respects to name of holder as specified on the face of the Warrant)

Warrant Shares Exercise Log

Date	Number of Warrant Shares Available to be Exercised	Number of Warrant Shares Exercised	Number of Warrant Shares Remaining to be Exercised

BIONANO GENOMICS, INC.
WARRANT DATED
WARRANT NO. [ ]

FORM OF ASSIGNMENT

[To be completed and signed only upon transfer of Warrant]

FOR VALUE RECEIVED, the undersigned hereby sells, assigns and transfers unto the right represented by the above-captioned Warrant to purchase shares of Common Stock to which such Warrant relates and appoints attorney to transfer said right on the books of the Company with full power of substitution in the premises.

Dated: _____, _____

_____

(Signature must conform in all respects to name of holder as specified on the face of the Warrant)

_____

Address of Transferee:

In the presence of

_____

_____

_____

EIGHTH AMENDED AND RESTATED CERTIFICATE OF INCORPORATION OF BIONANO GENOMICS, INC.

(Pursuant to Sections 242 and 245 of the
General Corporation Law of the State of Delaware)

BioNano Genomics, Inc., a corporation organized and existing under and by virtue of the provisions of the General Corporation Law of the State of Delaware, as the same may be amended from time to time (the "**General Corporation Law**").

DOES HEREBY CERTIFY:

1. That the original name of this corporation was BioNanomatrix, Inc. and the Certificate of Incorporation of this corporation was originally filed with the Secretary of State of the State of Delaware on August 16, 2007.

2. That the Board of Directors of this corporation (the "**Board**") duly adopted resolutions proposing to amend and restate the Seventh Amended and Restated Certificate of Incorporation of this corporation, as amended (the "**Restated Certificate**"), declaring said amendment and restatement to be advisable and in the best interests of this corporation and its stockholders, and authorizing the appropriate officers of this corporation to solicit the consent of the stockholders therefor, which resolution setting forth the proposed amendment and restatement is as follows:

RESOLVED, that the Restated Certificate be amended and restated in its entirety to read as follows:

FIRST: The name of this corporation is BioNano Genomics, Inc. (the "**Corporation**").

SECOND: The address of the registered office of the Corporation in the State of Delaware is 1209 Orange Street, in the City of Wilmington, County of New Castle, DE 19801. The name of its registered agent at such address is The Corporation Trust Company.

THIRD: The nature of the business or purposes to be conducted or promoted is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law.

FOURTH: The total number of shares of all classes of stock which the Corporation shall have authority to issue is (i) 190,268,153 shares of Common Stock, $0.0001 par value per share ("**Common Stock**") and (ii) 165,153,010 shares of Preferred Stock, par value $0.0001 per share, 418,767 shares of which are designated "Series A Convertible Participating Preferred Stock" (the "**Series A Preferred Stock**"), 8,101,042 shares of which are designated "Series B Convertible Participating Preferred Stock" (the "**Series B Preferred Stock**"), 7,523,734 shares of which are designated "Series B-1 Convertible Participating Preferred Stock" (the "**Series B-1 Preferred Stock**", and together with the Series B Preferred Stock, the "**Series B/B-1 Preferred Stock**,"), 23,357,047 shares of which are designated "Series C Convertible Participating Preferred Stock"

(the "**Series C Preferred Stock**"), 52,835,720 shares of which are designated "Series D Convertible Participating Preferred Stock" (the "**Series D Preferred Stock**"), and 72,916,700 shares of which are designated "Series D-1 Convertible Participating Preferred Stock" (the "**Series D-1 Preferred Stock**" and, together with the Series A Preferred Stock, the Series B/B-1 Preferred Stock, the Series C Preferred Stock, and the Series D Preferred Stock, the "**Series Preferred**").

Effective at the time of filing of this Certificate of Incorporation with the Secretary of State of the State of Delaware, every ten (10) shares of Common Stock issued and outstanding shall, automatically and without any action on the part of the respective holder thereof, be converted, combined into and shall become one (1) share of Common Stock without increasing or decreasing the par value of each share of Common Stock (the "**Reverse Split**"); provided, however, that the Corporation shall issue no fractional shares of Common Stock as a result of the Reverse Split, but shall instead pay to any stockholder who would be entitled to receive a fractional share as a result of the actions set forth herein a sum in cash equal to the fair market value of the shares constituting such fractional share as determined in good faith by the Board. The Reverse Split shall occur whether or not the certificates representing such shares of Common Stock are surrendered to the Corporation or its transfer agent. The Reverse Split shall be effected on a record holder-by-record holder basis, such that any fractional shares of Common Stock resulting from the Reverse Split and held by a single record holder shall be aggregated. All amounts in this Certificate of Incorporation have been adjusted to reflect the Reverse Split. All certificates representing shares of Common Stock outstanding immediately prior to the filing of this Certificate of Incorporation shall immediately after the filing of this Certificate of Incorporation represent a number of shares of Common Stock as adjusted to reflect the Reverse Split.

The following is a statement of the designations and the powers, privileges and rights, and the qualifications, limitations or restrictions thereof in respect of each class of capital stock of the Corporation.

A. COMMON STOCK

1. General. Except as required by law or as provided in this Eighth Amended and Restated Certificate of Incorporation (this "**Certificate of Incorporation**"), all shares of Common Stock shall be identical in all respects and shall entitle the holders thereof to the same rights and privileges, subject to the same qualifications, limitations and restrictions. The voting, dividend and liquidation rights of the holders of the Common Stock are subject to and qualified by the rights, powers and preferences of the holders of the Series Preferred set forth herein.

2. Dividends and Distributions. Subject to the provisions of this Certificate of Incorporation, including Section B.1 of Article Fourth, the holders of shares of Common Stock shall be entitled to receive such dividends and distributions, payable in cash or otherwise, as may be declared thereon by the Board from time to time out of assets or funds of the Corporation legally available therefor. The holders of shares of Common Stock shall be entitled to share equally, on a per share basis, in such dividends or distributions, subject to the limitations described below.

3. Voting. The holders of shares of Common Stock are entitled to one vote for each share of Common Stock held at all meetings of stockholders (and written actions in lieu of meetings); provided, however, that, except as otherwise required by law, holders of Common Stock, as such, shall not be entitled to vote on any amendment to this Certificate of Incorporation that relates solely to the terms of one or more outstanding series of Series Preferred if the holders of such affected series are entitled, either separately or together with the holders of one or more other such series, to vote thereon pursuant to this Certificate of Incorporation or pursuant to the General Corporation Law. There shall be no cumulative voting. The number of authorized shares of Common Stock may be increased or decreased (but not below the number of shares thereof then outstanding) by (in addition to any vote of the holders of one or more series of Series Preferred that may be required by the terms of this Certificate of Incorporation) the affirmative vote of the holders of shares of capital stock of the Corporation representing a majority of the votes represented by all outstanding shares of capital stock of the Corporation entitled to vote (voting together as a single class) without the approval of the holders of Common Stock voting as a separate class, irrespective of the provisions of Section 242(b)(2) of the General Corporation Law.

4. Liquidation. After the payments to holders of Series Preferred pursuant to Section B.2 of Article Fourth, the holders of Common Stock shall be entitled to liquidation distributions, if any, with holders of Series Preferred on an as converted basis pursuant to Subsection B.2.2 of Article Fourth.

B. PREFERRED STOCK

Unless otherwise indicated, references to “Sections” or “Subsections” in this Part B of this Article Fourth refer to sections and subsections of Part B of this Article Fourth.

1. Dividends.

1.1 Series Preferred Dividends. From the date of the issuance of the Series D-1 Preferred Stock, holders of the Series Preferred shall be entitled to receive, when, as and if declared by the Board, but only out of funds legally available therefor, cash dividends at the rate of eight percent (8%) of the applicable 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 and shall be non-cumulative. The Corporation shall not declare, pay or set aside any dividends on shares of any other class or series of capital stock of the Corporation (other than dividends on shares of Common Stock payable in shares of Common Stock) unless (in addition to the obtaining of any consents required elsewhere in this Certificate of Incorporation) the holders of the Series Preferred then outstanding shall first receive, or simultaneously receive, a dividend on each outstanding share of Series Preferred in an amount at least equal to (i) in the case of a dividend on Common Stock or any class or series that is convertible into Common Stock, that dividend per share of Series Preferred as would equal the product of (A) the dividend payable on each share of such class or series determined, if applicable, as if all shares of such class or series had been converted into Common Stock and (B) the number of shares of Common Stock issuable upon conversion of a share of such series of Series Preferred, in each case calculated on the record date for determination of holders entitled to receive such dividend or (ii) in the case of a dividend on any class or series that is not

convertible into Common Stock, at a rate per share of such series of Series Preferred determined by (A) dividing the amount of the dividend payable on each share of such class or series of capital stock by the original issuance price of such class or series of capital stock (subject to appropriate adjustment in the event of any reorganization, stock dividend, stock split, combination or other similar recapitalization affecting such shares) and (B) multiplying such fraction by an amount equal to the applicable Original Issue Price for such series; provided that, if the Corporation declares, pays or sets aside, on the same date, a dividend on shares of more than one class or series of capital stock of the Corporation, the dividend payable to the holders of Series Preferred pursuant to this Section 1 shall be calculated based upon the dividend on the class or series of capital stock that would result in the highest Series Preferred dividend for such series. Notwithstanding the foregoing, the Corporation shall not declare, pay or set aside any dividends on any shares of Series Preferred other than shares of Series D-1 Preferred Stock unless the holders of the Series D-1 Preferred Stock then outstanding shall first receive, or simultaneously receive, full payment of a dividend on each outstanding share of Series D-1 Preferred Stock in an amount equal to the dividend payable pursuant to parts (i) and (ii) above. The "**Original Issue Price**" shall be $0.48 per share for the Series D-1 Preferred Stock, $0.48 per share for the Series D Preferred Stock, $1.4043 per share for the Series C Preferred Stock, $1.3995 per share for the Series B-1 Preferred Stock, $1.3995 per share for the Series B Preferred Stock and $2.733 per share for the Series A Preferred Stock, each subject to appropriate adjustment in the event of any reorganization, stock split, combination, reclassification, recapitalization or other similar event involving or affecting a change in the Corporation's capital structure. For the avoidance of doubt, all previously accrued but unpaid dividends are hereby cancelled upon the filing of this Certificate of Incorporation.

1.2 Adjustments. All numbers relating to the calculation of dividends pursuant to this Section 1 shall be subject to appropriate adjustment whenever there shall occur a reorganization, stock split, combination, reclassification, recapitalization or other similar event involving or affecting a change in the Corporation's capital structure to provide to the holders of Series Preferred the same economic return as they would have received in the absence of such event.

2. Liquidation, Dissolution or Winding Up; Certain Mergers, Consolidations and Asset Sales.

2.1 Preferential Payments to Holders of Series Preferred.

2.1.1 Series Preferred Liquidation Preference. In the event of any voluntary or involuntary liquidation, dissolution or winding up of the Corporation, or in the event of its insolvency, whether under the General Corporation Law, federal bankruptcy laws, or other applicable federal or state laws (each such event, a "**Liquidation Event**"), (i) the holders of shares of Series D Preferred Stock and Series D-1 Preferred Stock (the "**Series D/D-1 Preferred Stock**"), on a *pari pasu* basis, shall be entitled to receive, prior to and in preference to any payment or distribution (or any setting aside of any payment or distribution) to the holders of Series C Preferred Stock, Series B/B-1 Preferred Stock, Series A Preferred Stock, Common Stock or any other class or series of capital stock ranking on liquidation junior to the Series D/D-1 Preferred Stock, by reason of their ownership thereof, an amount per share equal to the applicable Liquidation Preference (as defined below); (ii) the holders of shares of Series C

Preferred Stock, on a *pari pasu* basis, shall be entitled to receive, prior to and in preference to any payment or distribution (or any setting aside of any payment or distribution) to the holders of Series B/B-1 Preferred Stock, Series A Preferred Stock, Common Stock or any other class or series of capital stock ranking on liquidation junior to the Series C Preferred Stock, by reason of their ownership thereof, an amount per share equal to the applicable Liquidation Preference; and (iii) the holders of shares of Series B/B-1 Preferred Stock and Series A Preferred Stock, on a *pari pasu* basis, shall be entitled to receive, prior to and in preference to any payment or distribution (or any setting aside of any payment or distribution) to the holders of Common Stock or any other class or series of capital stock ranking on liquidation junior to the Series B/B-1 Preferred Stock and Series A Preferred Stock, by reason of their ownership thereof, an amount per share equal to the applicable Liquidation Preference. As used herein, "**Liquidation Preference**" means, (I) where the Corporation is valued at $91,000,000 or below pursuant to a Liquidation Event, the sum of (i) the applicable Original Issue Price for such series of Series Preferred, plus (ii) the amount of any declared but unpaid dividends on shares of Series Preferred (the "**Aggregate Dividend Amount**") and (II) where the Corporation is valued at over $91,000,000, (x) with respect to the first $91,000,000 distributed, the sum of (i) the applicable Original Issue Price for such series of Series Preferred, plus (ii) the Aggregate Dividend Amount, and (y) with respect to all amounts remaining following the first distribution of $91,000,000 (the "**Remaining Amount**"), the first $10,000,000 of the Remaining Amount (or such lesser amount if the Remaining Amount is less than $10,000,000) shall be distributed among the holders of Series D/D-1 Preferred Stock, pro rata based on the number of shares held by each such holder. If upon any Liquidation Event, the assets of the Corporation available for distribution to its stockholders shall be insufficient to pay all of the holders of shares of Series Preferred the full amount to which they shall be entitled under this Subsection 2.1, (i) the holders of shares of Series D/D-1 Preferred Stock shall share ratably in any distribution of the assets available for distribution in proportion to the respective amounts which would otherwise be payable in respect of the shares held by them upon such distribution if all amounts payable on or with respect to such shares were paid in full; (ii) if there are any remaining assets of the Corporation available for distribution to the holders of shares of Series C Preferred Stock after the applicable Liquidation Preference has been fully paid to the holders of shares of Series D/D-1 Preferred Stock, the holders of shares of Series C Preferred Stock shall share ratably in any distribution of the assets available for distribution in proportion to the respective amounts which would otherwise be payable in respect of the shares held by them upon such distribution if all amounts payable on or with respect to such shares were paid in full; and (iii) if there are any remaining assets of the Corporation available for distribution to the holders of shares of Series A Preferred Stock and Series B/B-1 Preferred Stock after the applicable Liquidation Preference has been fully paid to the holders of shares of Series C Preferred Stock, and Series D/D-1 Preferred Stock, the holders of shares of Series A Preferred Stock and Series B/B-1 Preferred Stock shall share ratably in any distribution of the assets available for distribution in proportion to the respective amounts which would otherwise be payable in respect of the shares held by them upon such distribution if all amounts payable on or with respect to such shares were paid in full. In no event shall the payment of all or any portion of the Liquidation Preference be deemed to be a payment of dividends on any shares of Series Preferred to the extent permitted by applicable law.

2.2 Distribution of Remaining Assets. Upon a Liquidation Event, after the payment of the full Liquidation Preference as set forth in Subsection 2.1 above to all holders of shares of Series Preferred, the remaining assets of the Corporation available for distribution to its

stockholders shall be distributed among the holders of the shares of Series Preferred and Common Stock, pro rata based on the number of shares held by each such holder, treating for this purpose all such securities as if they had been converted to Common Stock pursuant to the terms of this Certificate of Incorporation immediately prior to such Liquidation Event.

2.3 Deemed Liquidation Events.

2.3.1 Definition. Each of the following events shall be considered a "**Deemed Liquidation Event**" unless the holders of at least 66-2/3% of the Series Preferred (the "**Requisite Holders**"), elect otherwise by written notice sent to the Corporation at least five (5) days prior to the effective date of any such event:

(a) a merger or consolidation in which

(i) the Corporation is a constituent party; or

(ii) a subsidiary of the Corporation is a constituent party and the Corporation issues shares of its capital stock pursuant to such merger or consolidation,

except any such merger or consolidation involving the Corporation or a subsidiary in which the shares of capital stock of the Corporation outstanding immediately prior to such merger or consolidation continue to represent, or are converted into or exchanged for shares of capital stock that represent, immediately following such merger or consolidation, a majority, by voting power, of the capital stock of (1) the surviving or resulting corporation or (2) if the surviving or resulting corporation is a wholly owned subsidiary of another corporation immediately following such merger or consolidation, the parent corporation of such surviving or resulting corporation (provided that, for the purpose of this Subsection 2.3.1, all shares of Common Stock issuable upon exercise of Options (as defined below) outstanding immediately prior to such merger or consolidation 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 Common Stock are converted or exchanged);

(b) the closing of the transfer in one transaction or a series of related transactions, to a person or group of affiliated persons (other than an underwriter of the Corporation's securities), of the Corporation's outstanding securities if, after such closing, such person or group of affiliated persons would hold 50% or more of the outstanding voting stock of the Corporation (or the surviving or acquiring entity); or

(c) the sale, lease, transfer, exclusive license or other disposition, in a single transaction or series of related transactions, by the Corporation or any subsidiary of the Corporation of all or substantially all the assets of the Corporation and its subsidiaries taken as a whole, or the sale or disposition (whether by merger or otherwise) of one or more subsidiaries of the Corporation if substantially all of the assets of the Corporation and its subsidiaries taken as a whole are held by such subsidiary or subsidiaries, except where such sale,

lease, transfer, exclusive license or other disposition is to a wholly owned subsidiary of the Corporation.

Notwithstanding anything to the contrary herein, the sale of shares of Series D-1 Preferred Stock by the Corporation under that certain Series D-1 Convertible Participating Preferred Stock Purchase Agreement, dated on or about the date hereof, by and among the Corporation and the Purchasers set forth on Exhibit A thereto (the "**Purchase Agreement**") shall not in any circumstances be considered a "Deemed Liquidation Event."

2.3.2 Transaction Payment. At least ten (10) business days prior to the consummation of a Deemed Liquidation Event, the Corporation, or if the Corporation is not a party to such transaction, the holders of shares of capital stock of the Corporation that are parties to such transaction, shall provide the holders of Series Preferred written notice of such event (the "**Event Notice**"). Unless the Requisite Holders deliver a notice to the Corporation within five (5) days after receipt of an Event Notice stating that such Deemed Liquidation Event shall not be treated as a Liquidation Event, a Deemed Liquidation Event shall be deemed to have been elected by such holders to be treated as a Liquidation Event in which case the Corporation shall, and each holder of Series Preferred shall be entitled to require that, prior to or concurrently with consideration from any such Deemed Liquidation Event being paid to the Corporation (if the consideration is to be received by the Corporation in an asset transaction), or by any third party to stockholders of the Corporation other than holders of Series Preferred (if the consideration is to be received directly by such stockholders in a merger, consolidation, stock purchase or similar transaction), a payment (the "**Transaction Payment**") shall be made to the holders of Series Preferred in an amount equal to the amount that such holders would have received had the entire consideration in the transaction (with respect to a Deemed Liquidation Event involving the sale of all or substantially all the assets of the Corporation, net of any liabilities of the Corporation not assumed or otherwise paid by the acquiring entity) been deemed available assets for distribution to the stockholders of the Corporation upon liquidation pursuant to Subsections 2.1 and 2.2. In no event shall the payment of all or any portion of the Transaction Payment be deemed to be a payment of dividends on any shares of Series Preferred to the extent permitted by applicable law. The Corporation shall not have the power to effect a Deemed Liquidation Event unless the agreement or plan of merger or consolidation provides that the consideration payable to the stockholders of the Corporation shall be allocated among the stockholders of the Corporation in accordance with Subsections 2.1 and 2.2.

2.3.3 Payment of Transaction Payment. If securities of the acquiring entity (the "**Acquiring Entity Stock**") or other property are issued to the holders of the Series Preferred and Common Stock in the Deemed Liquidation Event, then, the Transaction Payment shall be paid to the holders of Series Preferred in such portions of cash, property or Acquiring Entity Stock, such that all holders of Series Preferred and Common Stock shall receive the same proportion of cash, property and Acquiring Entity Stock in respect of the amounts to which they are entitled pursuant to Subsections 2.1 and 2.2. The Acquiring Entity Stock utilized to make the Transaction Payment, if any, shall have the same rights, preferences and restrictions (including whether the issuance or sale of such Acquiring Entity Stock is registered or entitled to registration rights) as the Acquiring Entity Stock issued to the holders of Common Stock in the Deemed Liquidation Event. Notwithstanding the foregoing, neither the Corporation nor the acquiring entity shall be obligated to deliver certificates evidencing the Acquiring Entity Stock

or other property deliverable to a holder of Series Preferred as a result of the Liquidation Event unless and until the certificates representing shares of Series Preferred held by such holder are either delivered to the Corporation or the acquiring entity, or their respective transfer agents, as the Corporation and the acquiring entity may require, duly endorsed in blank for transfer, or the holder certifies in writing to the Corporation or the acquiring entity, or their respective transfer agents, as the Corporation and the acquiring entity may require, that such certificates have been lost, stolen or destroyed and executes an agreement satisfactory to the Corporation or such acquiring entity to indemnify the Corporation and/or such acquiring entity from any loss incurred by it in connection with such certificates. The value of the Acquiring Entity Stock or other property determined as follows shall be used for purposes of determining the amount of the entire consideration in the transaction, the Transaction Payment and the payment thereof. If the consideration received by the Corporation or its stockholders ("**Proceeds**") is other than cash or evidences of indebtedness (for which the value thereof shall be deemed to be the principal amount thereof), its value will be deemed its fair market value, determined as follows:

(a) Any securities (including any Acquiring Entity Stock) included in the Proceeds shall be valued as follows:

(i) If traded on a securities exchange or through the Nasdaq National Market, the value shall be deemed to be the average of the closing prices of the securities on such exchange or system over the twenty (20) trading-day period ending three (3) trading days prior to the closing of the Deemed Liquidation Event;

(ii) If actively traded over-the-counter, the value shall be deemed to be the average of the closing bid or sale prices (whichever is applicable) over the twenty (20) trading-day period ending three (3) trading days prior to the closing of the Deemed Liquidation Event; and

(iii) If there is no active public market, the value shall be the fair market value thereof, as determined by an independent appraisal conducted by an independent third party valuation firm (at the expense of the Corporation) and approved by the Board.

(b) Any Proceeds other than cash, evidences of indebtedness, and securities shall have the fair market value of such Proceeds as determined by an independent appraisal conducted by an independent third party valuation firm (at the expense of the Corporation) and approved by the Board.

(c) The foregoing methods for valuing Proceeds to be distributed or delivered in connection with a Deemed Liquidation Event shall, upon approval by the stockholders of the definitive agreements governing the Deemed Liquidation Event, be

superseded by any determination of such value set forth in the definitive agreements governing such Deemed Liquidation Event.

(d) Contingent Consideration. In the event of a Deemed Liquidation Event, if any portion of the consideration payable to the stockholders of the Corporation is placed into escrow or is payable to the stockholders of the Corporation subject to contingencies, then, in such event, the definitive acquisition agreement relating to such Deemed Liquidation Event shall provide that (i) the portion of such consideration that is not placed in escrow and not subject to any contingencies (the "**Initial Consideration**") shall be allocated among the holders of capital stock of the Corporation in accordance with Subsections 2.1 and 2.2 as if the Initial Consideration were the only consideration payable in connection with such Deemed Liquidation Event and (ii) any additional consideration which becomes payable to the stockholders of the Corporation upon release from escrow or satisfaction of the applicable contingency shall be allocated among the holders of capital stock of the Corporation in accordance with Subsections 2.1 and 2.2 after taking into account the previous payment of the Initial Consideration and any other amounts previously released from escrow or paid upon satisfaction of any contingency to the stockholders of the Corporation as part of the same transaction.

3. Voting.

3.1 General. On any matter presented to the stockholders of the Corporation for their action or consideration at any meeting of stockholders of the Corporation (or by written consent of stockholders in lieu of meeting), each holder of outstanding shares of Series Preferred shall be entitled to cast the number of votes equal to the number of whole shares of Common Stock into which the shares of Series Preferred held by such holder are convertible as of the record date for determining stockholders entitled to vote on such matter. Except as provided by law or by the other provisions of this Certificate of Incorporation, holders of Series Preferred shall vote together with the holders of Common Stock as a single class. Each holder of Series Preferred shall be entitled to notice of any stockholders' meeting in accordance with the Bylaws of the Corporation at the same time and in the same manner as notice is given to all other stockholders entitled to vote at such meetings.

3.2 Election of Directors. The number of directors constituting the Board shall be seven (7).

3.2.1 Series D-1 Directors. For so long as any shares of Series D-1 Preferred Stock remain outstanding, the holders of Series D-1 Preferred Stock shall be entitled to elect two (2) members of the Board at each meeting or pursuant to each consent of the Corporation's stockholders for the election of directors.

3.2.2 Series C Director. For so long as any shares of Series C Preferred Stock remain outstanding, the holders of Series C Preferred Stock shall be entitled to elect one (1) member of the Board at each meeting or pursuant to each consent of the Corporation's stockholders for the election of directors.

3.2.3 Series B/B-1 Director. For so long as any shares of Series B/B-1 Preferred Stock remain outstanding, the holders of Series B/B-1 Preferred Stock, voting together as a single class, shall be entitled to elect one (1) member of the Board at each meeting or pursuant to each consent of the Corporation's stockholders for the election of directors.

3.2.4 Common Director. The holders of record of the shares of Common Stock, exclusively and 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 Corporation's stockholders for the election of directors, which will be the Corporation's Chief Executive Officer.

3.2.5 Remaining Directors. The balance of the total number of directors of the Corporation shall be elected by the holders of record of a majority of the shares of Series Preferred and Common Stock, voting together as a single class.

3.2.6 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 classes or series entitled to elect such director shall constitute a quorum for the purpose of electing such director. Any director elected as provided in this Subsection 3.2 may be removed without cause by, and only by, the affirmative vote of the holders of the shares of the classes or series of capital 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. A vacancy in any directorship filled by the holders of any classes or series shall be filled only by vote or written consent in lieu of a meeting of the holders of such classes or series or by any remaining director or directors elected by the holders of such class or series pursuant to this Subsection 3.2.

3.2.7 Additional Voting Rights. The Series Preferred shall have the additional voting rights specified in Subsection 3.3.

3.3 Series Preferred Protective Provisions.

3.3.1 At any time when any shares of Series Preferred are outstanding, the Corporation shall not, either directly or indirectly by amendment, merger, consolidation, reorganization, via a subsidiary or otherwise, do any of the following without (in addition to any other vote required by law or this Certificate of Incorporation) the written consent or affirmative vote of the Requisite Holders given in writing or by vote at a meeting, consenting or voting (as the case may be) separately as a class, and any such act or transaction entered into without such consent or vote shall be null and void *ab initio*, and of no force or effect:

(a) alter or change the rights, preferences or privileges of the Series Preferred;

(b) authorize or issue any equity security senior to or on a parity with any series of Series Preferred as to dividend rights or redemption rights or liquidation preferences;

(c) authorize any new issuance of any equity securities of the Corporation, excluding (a) any issuance of Common Stock upon conversion of the Series

Preferred pursuant to this Certificate of Incorporation, and (b) the issuance of Common Stock (or options or warrants therefor) under employee equity incentive plans approved by the Board, provided, that the following items shall require the affirmative consent of at least one (1) LC Director (as such term is defined in that certain Fifth Amended and Restated Stockholders Agreement, dated on or about the date hereof (as the same may be amended from time to time, the "Stockholders Agreement")): (i) any award that does not consist solely of a grant of Options (as each such term is defined in the Corporation's 2006 Equity Compensation Plan, as amended); (ii) any such award that, at the time of grant, the exercise of which involves more than one percent (1%) of the Corporation's then outstanding equity securities; (iii) any such award that deviates from the Vesting Terms (as such term is defined in that certain Fifth Amended and Restated Investors' Rights Agreement, dated on or about the date hereof, as the same may be amended from time to time); and (iv) the settlement of any such awards, on or prior to a Qualified IPO, with grantees who are residents of the People's Republic of China, by way of repurchase, redemption, exchange or similar transactions.

(d) increase the number of shares of the Corporation's capital stock reserved for issuance upon exercise of Options or Convertible Securities or upon the grant or award of stock or stock related rights to employees, officers or directors of, or consultants, advisors or service providers to, the Corporation pursuant to equity compensation or incentive plans or arrangements above the number of shares authorized on the filing date of this Certificate of Incorporation (subject to appropriate adjustment in the event of any reorganization, stock split, combination, reclassification, recapitalization or other similar event involving or affecting a change in the Corporation's capital structure);

(e) amend the Corporation's 2006 Equity Compensation Plan, as amended, or approve any new equity compensation or incentive plan;

(f) amend or waive any provision of the Corporation's Certificate of Incorporation or Bylaws in a manner that would alter or change the rights, preferences or privileges of any Series Preferred;

(g) increase or decrease the authorized number of shares of Common Stock or Series Preferred;

(h) redeem or repurchase any shares of capital stock of the Corporation (other than (i) redemptions of the Series D-1 Preferred Stock as expressly authorized herein or (ii) pursuant to equity incentive agreements with service providers giving the Corporation the right to repurchase shares upon the termination of services);

(i) effect any Liquidation Event or Sale of the Company (as such term is defined in the Stockholders Agreement) or any voluntary recapitalization, reorganization or bankruptcy, or consent to any of the foregoing;

(j) increase or decrease the authorized size of the Board, or create a committee of the Board;

(k) declare or pay any dividends on or make any distribution on, or agree or obligate itself to declare or pay any dividends on or make any distribution on,

Series Preferred, Common Stock or any other capital stock of the Corporation ranking junior to the Series Preferred with respect the payment of dividends;

(l) authorize the extension by the Corporation of any loan or guarantee for indebtedness in excess of $500,000 in the aggregate to any third party (except for trade accounts of the Corporation or any subsidiary arising in the ordinary course of business);

(m) create or incur or authorize the creation or incurrence of any new indebtedness for borrowed money (or any increase of any existing indebtedness for borrowed money as of the filing date of this Certificate of Incorporation) in excess of $1,000,000 in the aggregate;

(n) mortgage or pledge, or create a security interest in, or permit any subsidiary to mortgage, pledge or create a security interest in, the property or assets of the Corporation or such subsidiary;

(o) authorize the acquisition of one or more businesses or assets with a purchase price in excess of $3,000,000 in the aggregate;

(p) authorize the appointment or replacement of the Chief Executive Officer, Chief Financial Officer, Chief Operating Officer, or Chief Scientific Officer of the Corporation;

(q) authorize any transaction involving both the Corporation and any of the Corporation's employees, officers, directors or stockholders or any affiliate thereof, except for (i) arms-length employment agreements, and (ii) any arms-length transaction that is in the ordinary course of business;

(r) authorize appointment and removal of auditors of the Corporation or any material change in the accounting and financial policies of the Corporation;

(s) authorize any increase in compensation of any employee of the Corporation with monthly salary of at least $30,000 by more than 50% in a 12 month period (provided that this clause (r) does not reduce or modify the authority of the Board to generally review and approve executive compensation);

(t) authorize any items of expenditure outside the annual budget in excess of $500,000 per month, individually or in the aggregate;

(u) create or fund any subsidiary, or permit any subsidiary to hold capital stock in any other subsidiary or any other corporation, partnership, limited liability company or other entity;

(v) enter into new lines of business or materially change the nature of the Corporation's existing line of business;

(w) enter into or become a party to any transaction or agreement, or otherwise take any action, which would result in or give rise to the taxation of holders of Series Preferred under Section 305 Internal Revenue Code of 1986, as amended; and

(x) enter into a binding agreement to do any of the foregoing, or effect any of the foregoing, as applicable, with respect to any direct or indirect subsidiary or affiliate of the Corporation.

4. Optional Conversion.

The holders of the Series Preferred shall have conversion rights as follows (the "**Conversion Rights**"):

4.1 Right to Convert.

4.1.1 Series Preferred Conversion Ratio. Each share of Series Preferred shall be convertible, at the option of the holder thereof, at any time and from time to time, and without the payment of additional consideration by the holder thereof, into fully paid and nonassessable shares of Common Stock. The number of shares of Common Stock which a holder of Series Preferred shall be entitled to receive upon conversion shall be equal to the product obtained by multiplying (a) the number of shares of Series Preferred being converted at any time by (b) the applicable Conversion Rate (as defined below) then in effect. The "**Conversion Rate**" in effect at any time shall be equal to the sum of (x) the quotient obtained by dividing the applicable Original Conversion Value (as defined below), by the applicable Conversion Price (as defined below) then in effect plus (y) the quotient obtained by dividing an amount equal to the applicable Aggregate Dividend Amount on each share of Series Preferred by an amount equal to the then current fair market value, as determined in good faith by the Board, of one share of Common Stock at the time of any such conversion. The "**Original Conversion Value**" and the "**Conversion Price**" shall initially be equal to $0.48 per share for each of the Series D-1 Preferred Stock, $0.48 per share for each of the Series D Preferred Stock, $1.4043 per share for each of the Series C Preferred Stock and $1.3995 per share for each of the Series B-1 Preferred Stock, the Series B Preferred Stock and the Series A Preferred Stock (each as adjusted in the event of any reorganization, stock split, combination, reclassification, recapitalization or other similar event involving or affecting a change in the Corporation's capital structure). The initial Conversion Price of each series of Series Preferred, and the rate at which shares of Series Preferred may be converted into shares of Common Stock, shall be subject to adjustment as provided below.

4.1.2 Termination of Conversion Rights. In the event of a Liquidation Event or a Deemed Liquidation Event, the Conversion Rights shall terminate at the close of business on the last full day preceding the date fixed for the payment of any such amounts distributable on such event to the holders of Series Preferred.

4.2 Fractional Shares. No fractional shares of Common Stock shall be issued upon conversion of the Series Preferred. In lieu of any fractional shares to which the holder would otherwise be entitled, the Corporation 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 Board.

Whether or not fractional shares would be issuable upon such conversion shall be determined on the basis of the total number of shares of Series Preferred the holder is at the time converting into Common Stock and the aggregate number of shares of Common Stock issuable upon such conversion.

4.3 Mechanics of Conversion.

4.3.1 Notice of Conversion. In order for a holder of Series Preferred to voluntarily convert shares of Series Preferred into shares of Common Stock, such holder shall surrender the certificate or certificates for such shares of Series Preferred (or, if such registered holder alleges that such certificate has been lost, stolen or destroyed, a lost certificate affidavit and agreement reasonably acceptable to the Corporation to indemnify the Corporation against any claim that may be made against the Corporation on account of the alleged loss, theft or destruction of such certificate), at the office of the transfer agent for the Series Preferred (or at the principal office of the Corporation if the Corporation serves as its own transfer agent), together with written notice that such holder elects to convert all or any number of the shares of the Series Preferred represented by such certificate or certificates and, if applicable, any event on which such conversion is contingent. Such notice shall state such holder's name or the names of the nominees in which such holder wishes the certificate or certificates for shares of Common Stock to be issued. If required by the Corporation, certificates surrendered for conversion shall be endorsed or accompanied by a written instrument or instruments of transfer, in form reasonably satisfactory to the Corporation, duly executed by the registered holder or his, her or its attorney duly authorized in writing. The close of business on the date of receipt by the transfer agent (or by the Corporation if the Corporation serves as its own transfer agent) of such certificates (or lost certificate affidavit and agreement) and notice shall be the time of conversion (the "**Conversion Time**"), and the shares of Common Stock issuable upon conversion of the shares represented by such certificate shall be deemed to be outstanding of record as of such date. The Corporation shall, as soon as practicable after the Conversion Time, issue and deliver to such holder of Series Preferred, or to his, her or its nominees, a certificate or certificates for the number of full shares of Common Stock issuable upon such conversion in accordance with the provisions hereof, together with cash as provided in Subsection 4.2 in lieu of any fraction of a share of Common Stock otherwise issuable upon such conversion.

4.3.2 Reservation of Shares. The Corporation shall at all times when any shares of Series Preferred are outstanding, reserve and keep available out of its authorized but unissued capital stock, for the purpose of effecting the conversion of the Series Preferred, such number of its duly authorized shares of Common Stock as shall from time to time be sufficient to effect the conversion of all outstanding Series Preferred; and if at any time the number of authorized but unissued shares of Common Stock shall not be sufficient to effect the conversion of all then outstanding shares of the Series Preferred, the Corporation shall 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 purposes, including, without limitation, engaging in reasonable best efforts to obtain the requisite stockholder approval of any necessary amendment to this Certificate of Incorporation. Before taking any action which would cause an adjustment reducing the Conversion Price for any series of Series Preferred below the then par value of the shares of Common Stock issuable upon conversion of such series of Series Preferred, the Corporation will take any corporate action which may, in the opinion of its

counsel, be necessary in order that the Corporation may validly and legally issue fully paid and nonassessable shares of Common Stock at such adjusted Conversion Price, as applicable.

4.3.3 Effect of Conversion. All shares of Series Preferred which shall have been surrendered for conversion as herein provided shall no longer be deemed to be outstanding and all rights with respect to such shares, including the rights, if any, to receive notices and to vote, shall immediately cease and terminate at the Conversion Time, except only the right of the holders thereof to receive shares of Common Stock in exchange therefor. Any shares of Series Preferred so converted shall be retired and cancelled and shall not be reissued as shares of such series, and the Corporation (without the need for stockholder action) may from time to time take such appropriate action as may be necessary to reduce the authorized number of shares of Series Preferred accordingly.

4.3.4 No Further Adjustment. Upon any such conversion, no adjustment to the applicable Conversion Price shall be made for any declared but unpaid dividends on the Series Preferred surrendered for conversion or on the Common Stock delivered upon conversion.

4.3.5 Taxes. The Corporation shall pay any and all issue and other similar taxes (but not any income or similar taxes) that may be payable in respect of any issuance or delivery of shares of Common Stock upon conversion of shares of Series Preferred pursuant to this Section 4. The Corporation shall not, however, be required to pay any tax which may be payable in respect of any transfer involved in the issuance and delivery of shares of Common Stock in a name other than that in which the shares of Series Preferred so converted were registered, and no such issuance or delivery shall be made unless and until the person or entity requesting such issuance has paid to the Corporation the amount of any such tax or has established, to the satisfaction of the Corporation, that such tax has been paid.

4.4 Adjustments to Conversion Price for Diluting Issues.

4.4.1 Special Definitions. For purposes of this Article Fourth, the following definitions shall apply:

(a) **"Convertible Securities"** shall mean any evidences of indebtedness, shares or other securities directly or indirectly convertible into or exchangeable for Common Stock, but excluding Options.

(b) **"Option"** shall mean rights, options or warrants to subscribe for, purchase or otherwise acquire Common Stock or Convertible Securities.

(c) **"Series Preferred Original Issue Date"** shall mean the Series A Original Issue Date with respect to the Series A Preferred Stock, the Series B Original Issue Date with respect to the Series B/B-1 Preferred Stock, the Series C Original Issue Date with respect to the Series C Preferred Stock, the Series D Original Issue Date with respect to the Series D Preferred Stock and the Series D-1 Original Issue Date with respect to the SeriesD-1 Preferred Stock.

(d) **"Series A Original Issue Date"** shall mean the date on which the first share of Series A Preferred Stock was issued.

(e) **"Series B Original Issue Date"** shall mean the date on which the first share of Series B Preferred Stock was issued.

(f) **"Series C Original Issue Date"** shall mean the date on which the first share of Series C Preferred Stock was issued.

(g) **"Series D Original Issue Date"** shall mean the date on which the first share of Series D Preferred Stock was issued.

(h) "**Series D-1 Original Issue Date**" shall mean the date on which the first share of Series D-1 Preferred Stock was issued.

(i) **"Additional Shares of Common Stock"** shall mean all shares of Common Stock issued (or, pursuant to Subsection 4.4.3 below, deemed to be issued) by the Corporation after the applicable Series Preferred Original Issue Date, other than the following shares of Common Stock, and shares of Common Stock deemed issued pursuant to the following Options and Convertible Securities (collectively "**Exempted Securities**"):

(i) shares of Common Stock, Options or Convertible Securities issued as a dividend or distribution on the Series Preferred;

(ii) shares of Common Stock, Options or Convertible Securities issued by reason of a dividend, stock split, split-up or other distribution on shares of Common Stock that is covered by Subsections 4.5, 4.6, 4.7 or 4.8 below;

(iii) shares of Common Stock or Options issued to employees or directors of, or consultants or advisors to, the Corporation or any of its subsidiaries pursuant to a plan, agreement or arrangement approved by the Board;

(iv) shares of Common Stock or Convertible Securities actually issued upon the exercise of Options or shares of Common Stock actually issued upon the conversion or exchange of Convertible Securities, in each case provided such issuance is pursuant to the terms of such Option or Convertible Security;

(v) shares of Common Stock, Options or Convertible Securities issued in connection with sponsored research, collaboration, technology license, development, OEM, marketing, customer, vendor, supplier or other similar agreements or strategic transactions entered into for primarily non-equity financing purposes where both the transaction and

its status as not constituting an anti-dilution trigger are approved by the Board (including the affirmative consent of at least one (1) LC Director);

(vi) shares of Common Stock, Options or Convertible Securities issued in connection with equipment lease financing arrangements, or bank financing transactions, in each case, approved by the Board (including the affirmative consent of at least one (1) LC Director);

(vii) shares of Common Stock, Options or Convertible Securities issued in connection with acquisitions or business combinations, in each case, approved by the Requisite Holders;

(viii) shares of Common Stock, Options or Convertible Securities issued or issuable pursuant to the terms of any Options, Convertible Securities or any arrangements or agreements to issue Options or Convertible Securities outstanding immediately prior to the filing of this Certificate of Incorporation; or

(ix) shares of Common Stock or Convertible Securities issued or issuable pursuant to the terms of the Purchase Agreement.

4.4.2 No Adjustment of Applicable Conversion Price. No adjustment in the Conversion Price for the Series Preferred shall be made as the result of the issuance or deemed issuance of Additional Shares of Common Stock if the Corporation receives written notice from the Requisite Holders agreeing that no such adjustment shall be made as the result of the issuance or deemed issuance of such Additional Shares of Common Stock.

4.4.3 Deemed Issue of Additional Shares of Common Stock.

(a) If the Corporation at any time or from time to time after the applicable Series Preferred Original Issue Date shall issue any Options or Convertible Securities (excluding Options or Convertible Securities which are themselves Exempted Securities) or shall fix a record date for the determination of holders of any class of securities entitled to receive any such Options or Convertible Securities, then the maximum number of shares of Common Stock (as set forth in the instrument relating thereto, assuming the satisfaction of any conditions to exercisability, convertibility or exchangeability but without regard to any provision contained therein for a subsequent adjustment of such number) issuable upon the exercise of such Options or, in the case of Convertible Securities and Options therefor, the conversion or exchange of such Convertible Securities, shall be deemed to be Additional Shares of Common Stock issued as of

the time of such issue or, in case such a record date shall have been fixed, as of the close of business on such record date.

(b) If the terms of any Option or Convertible Security, the issuance of which resulted in an adjustment to the applicable Conversion Price for any series of Series Preferred pursuant to the terms of Subsections 4.4.4 below, are revised as a result of an amendment to such terms or any other adjustment pursuant to the provisions of such Option or Convertible Security (but excluding automatic adjustments to such terms pursuant to anti-dilution or similar provisions of such Option or Convertible Security) to provide for either (1) any increase or decrease in the number of shares of Common Stock issuable upon the exercise, conversion and/or exchange of any such Option or Convertible Security or (2) any increase or decrease in the consideration payable to the Corporation upon such exercise, conversion and/or exchange, then, effective upon such increase or decrease becoming effective, the applicable Conversion Price for such series of Series Preferred computed upon the original issue of such Option or Convertible Security (or upon the occurrence of a record date with respect thereto) shall be readjusted to such applicable Conversion Price as would have been obtained had such revised terms been in effect upon the original date of issuance of such Option or Convertible Security. Notwithstanding the foregoing, no readjustment pursuant to this clause (b) shall have the effect of increasing the applicable Conversion Price for any series of Series Preferred to an amount which exceeds the lower of (i) the applicable Conversion Price for such series in effect immediately prior to the original adjustment made as a result of the issuance of such Option or Convertible Security, or (ii) the applicable Conversion Price for such series that would have resulted from any issuances of Additional Shares of Common Stock (other than deemed issuances of Additional Shares of Common Stock as a result of the issuance of such Option or Convertible Security) between the original adjustment date and such readjustment date.

(c) If the terms of any Option or Convertible Security (excluding Options or Convertible Securities which are themselves Exempted Securities), the issuance of which did not result in an adjustment to the applicable Conversion Price for any series of Series Preferred pursuant to the terms of Subsections 4.4.4 below (either because the consideration per share (determined pursuant to Subsection 4.4.5 hereof) of the Additional Shares of Common Stock subject thereto was equal to or greater than the applicable Conversion Price for each such series then in effect, or because such Option or Convertible Security was issued before the applicable Series Preferred Original Issue Date), are revised after the Series Preferred Original Issue Date as a result of an amendment to such terms or any other adjustment pursuant to the provisions of such Option or Convertible Security (but excluding automatic adjustments to such terms pursuant to anti-dilution or similar provisions of such Option or Convertible Security) to provide for either (1) any increase or decrease in the number of shares of Common Stock issuable upon the exercise, conversion or exchange of any such Option or Convertible Security or (2) any increase or decrease in the consideration payable to the Corporation upon such exercise, conversion or exchange, then such Option or Convertible Security, as so amended or adjusted, and the Additional Shares of Common Stock subject thereto (determined in the manner provided in Subsection 4.4.3(a) above) shall be deemed to have been issued effective upon such increase or decrease becoming effective.

(d) Upon the expiration or termination of any unexercised Option or unconverted or unexchanged Convertible Security (or portion thereof) which resulted

(either upon its original issuance or upon a revision of its terms) in an adjustment to the applicable Conversion Price for any series of Series Preferred pursuant to the terms of Subsections 4.4.4 below, the applicable Conversion Price for such series shall be readjusted to such applicable Conversion Price as would have been obtained had such Option or Convertible Security (or portion thereof) never been issued.

(e) If the number of shares of Common Stock issuable upon the exercise, conversion and/or exchange of any Option or Convertible Security, or the consideration payable to the Corporation upon such exercise, conversion and/or exchange, cannot be determined at the time such Option or Convertible Security is issued or amended, any adjustment to the applicable Conversion Price for any series of Series Preferred that would result under the terms of this Subsection 4.4.3 at the time of such issuance or amendment shall instead be effected at the time such number of shares and/or amount of consideration is first determinable (assuming for purposes of calculating such adjustment to the applicable Conversion Price for such series that such issuance or amendment took place at the time such determination can be made).

4.4.4 Adjustment of Conversion Price for Series D-1 Preferred Stock, Series D Preferred Stock, Series C Preferred Stock, Series B/B-1 Preferred Stock and Series A Preferred Stock Upon Issuance of Additional Shares of Common Stock. In the event the Corporation shall at any time after the Series D-1 Original Issue Date issue Additional Shares of Common Stock (including Additional Shares of Common Stock deemed to be issued pursuant to Subsection 4.4.3), without consideration or for a consideration per share less than the Conversion Price for the Series D-1 Preferred Stock, Series D Preferred Stock, Series C Preferred Stock, Series B/B-1 Preferred Stock or Series A Preferred Stock, as applicable, in effect immediately prior to such issue, then the Conversion Price for the Series D-1 Preferred Stock, Series D Preferred Stock, Series C Preferred Stock, Series B/B-1 Preferred Stock or Series A Preferred Stock, as applicable, shall be reduced, concurrently with such issue, to the consideration per share received by the Corporation for such issue or deemed issue of the Additional Shares of Common Stock; provided that if such issuance or deemed issuance was without consideration, then the Corporation shall be deemed to have received an aggregate of $0.0001 of consideration for all such Additional Shares of Common Stock issued or deemed to be issued.

4.4.5 Determination of Consideration. For purposes of this Subsection 4.4, the consideration received by the Corporation for the issuance of any Additional Shares of Common Stock shall be computed as follows:

(a) Cash and Property: Such consideration shall:

(i) insofar as it consists of cash, be computed at the aggregate amount of cash received by the Corporation, excluding amounts paid or payable for accrued interest;

(ii) insofar as it consists of property other than cash, be computed at the fair market value thereof at the time of such issue, as determined in good faith by

the Board (including the affirmative consent of at least one (1) LC Director); and

(iii) in the event Additional Shares of Common Stock are issued together with other shares or securities or other assets of the Corporation for consideration which covers both, be the proportion of such consideration so received, computed as provided in clauses (i) and (ii) above, as determined in good faith by the Board (including the affirmative consent of at least one (1) LC Director).

(b) Options and Convertible Securities. The consideration per share received by the Corporation for Additional Shares of Common Stock deemed to have been issued pursuant to Subsection 4.4.3, relating to Options and Convertible Securities, shall be determined by dividing:

(i) the total amount, if any, received or receivable by the Corporation as consideration for the issue of such Options or Convertible Securities, plus the minimum aggregate amount of additional consideration (as set forth in the instruments relating thereto, without regard to any provision contained therein for a subsequent adjustment of such consideration) payable to the Corporation upon the exercise of such Options or the conversion or exchange of such Convertible Securities, or in the case of Options for Convertible Securities, the exercise of such Options for Convertible Securities and the conversion or exchange of such Convertible Securities, by

(ii) the maximum number of shares of Common Stock (as set forth in the instruments relating thereto, without regard to any provision contained therein for a subsequent adjustment of such number) issuable upon the exercise of such Options or the conversion or exchange of such Convertible Securities, or in the case of Options for Convertible Securities, the exercise of such Options for Convertible Securities and the conversion or exchange of such Convertible Securities.

4.4.6 Multiple Closing Dates. In the event the Corporation shall issue on more than one date Additional Shares of Common Stock that are a part of one transaction or a series of related transactions and that would result in an adjustment to the Conversion Price for any series of Series Preferred pursuant to the terms of Subsection 4.4.4 above, and such issuance

dates occur within a period of no more than ninety (90) days from the first such issuance to the final such issuance, then, upon the final such issuance, the applicable Conversion Price for such series shall be readjusted to give effect to all such issuances as if they occurred on the date of the first such issuance (and without giving effect to any additional adjustments as a result of any such subsequent issuances within such period).

4.5 Adjustment for Stock Splits and Combinations. If the Corporation shall at any time or from time to time after the applicable Series Preferred Original Issue Date effect a subdivision of the outstanding Common Stock, the Conversion Price for each series of Series Preferred in effect immediately before that subdivision shall be proportionately decreased so that the number of shares of Common Stock issuable on conversion of each share of such series shall be increased in proportion to such increase in the aggregate number of shares of Common Stock outstanding. If the Corporation shall at any time or from time to time after the applicable Series Preferred Original Issue Date combine the outstanding shares of Common Stock, the Conversion Price for each series of Series Preferred in effect immediately before the combination shall be proportionately increased so that the number of shares of Common Stock issuable on conversion of each share of such series shall be decreased in proportion to such decrease in the aggregate number of shares of Common Stock outstanding. Any adjustment under this subsection shall become effective at the close of business on the date the subdivision or combination becomes effective.

4.6 Adjustment for Certain Dividends and Distributions. In the event the Corporation at any time or from time to time after the applicable Series Preferred Original Issue Date shall make or issue, or fix a record date for the determination of holders of Common Stock entitled to receive, a dividend or other distribution payable on the Common Stock in additional shares of Common Stock, then and in each such event the Conversion Price for each series of Series Preferred in effect immediately before such event shall be decreased as of the time of such issuance or, in the event such a record date shall have been fixed, as of the close of business on such record date, by multiplying the applicable Conversion Price for such series then in effect by a fraction equal to:

(1) the numerator of which shall be the total number of shares of Common Stock issued and outstanding immediately prior to the time of such issuance or the close of business on such record date, and

(2) the denominator of which shall be the total number of shares of Common Stock issued and outstanding immediately prior to the time of such issuance or the close of business on such record date plus the number of shares of Common Stock issuable in payment of such dividend or distribution.

Notwithstanding the foregoing, (a) if such record date shall have been fixed and such dividend is not fully paid or if such distribution is not fully made on the date fixed therefor, the Conversion Price for each series of Series Preferred shall be recomputed accordingly as of the close of business on such record date and thereafter the Conversion Price for each series shall be adjusted

pursuant to this subsection as of the time of actual payment of such dividends or distributions; and (b) that no such adjustment shall be made if the holders of Series Preferred simultaneously receive a dividend or other distribution of shares of Common Stock in a number equal to the number of shares of Common Stock as they would have received if all outstanding shares of Series Preferred had been converted into Common Stock on the date of such event.

4.7 Adjustments for Other Dividends and Distributions. In the event the Corporation at any time or from time to time after the applicable Series Preferred Original Issue Date shall make or issue, or fix a record date for the determination of holders of Common Stock entitled to receive, a dividend or other distribution payable in securities of the Corporation (other than a distribution of shares of Common Stock in respect of outstanding shares of Common Stock) or in other property and the provisions of Section 1 do not apply to such dividend or distribution, then and in each such event the holders of Series Preferred shall receive, simultaneously with the distribution to the holders of Common Stock, a dividend or other distribution of such securities or other property in an amount equal to the amount of such securities or other property as they would have received if all outstanding shares of Series Preferred had been converted into Common Stock on the date of such event.

4.8 Adjustment for Merger or Reorganization, etc. Subject to the provisions of Subsection 2.3, if there shall occur any reorganization, recapitalization, reclassification, consolidation, merger or similar event involving the Corporation in which the Common Stock (but not the Series Preferred) is converted into or exchanged for securities, cash or other property (other than a transaction covered by Subsections 4.4, 4.6 or 4.7), then, following any such reorganization, recapitalization, reclassification, consolidation or merger, 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 which a holder of the number of shares of Common Stock of the Corporation issuable upon conversion of one share of Series Preferred immediately prior to such reorganization, recapitalization, reclassification, consolidation or merger would have been entitled to receive pursuant to such transaction; and, in such case, appropriate adjustment (as determined in good faith by the Board) shall be made in the application of the provisions in this Section 4 with respect to the rights and interests thereafter of the holders of the Series Preferred, to the end that the provisions set forth in this Section 4 (including provisions with respect to changes in and other adjustments of the applicable Conversion Price for any series of Series Preferred) shall thereafter be applicable, as nearly as reasonably may be, in relation to any securities or other property thereafter deliverable upon the conversion of the Series Preferred.

4.9 Certificate as to Adjustments. Upon the occurrence of each adjustment or readjustment of the Conversion Price for any series of Series Preferred pursuant to this Section 4, the Corporation at its expense shall as promptly as reasonably practicable but in any event not later than ten (10) days thereafter, compute such adjustment or readjustment in accordance with the terms hereof and furnish to each holder of Series Preferred a certificate setting forth such adjustment or readjustment (including the kind and amount of securities, cash or other property into which the Series Preferred is convertible) and showing in detail the facts upon which such adjustment or readjustment is based. The Corporation shall, as promptly as reasonably practicable after the written request at any time of any holder of Series Preferred (but in any event not later than ten (10) days thereafter), furnish or cause to be furnished to such holder a

certificate setting forth (i) the Conversion Price for such series then in effect, and (ii) the number of shares of Common Stock and the amount, if any, of other securities, cash or property which then would be received upon the conversion of Series Preferred.

4.10 Notice of Record Date. In the event:

(a) the Corporation shall take a record of the holders of its Common Stock (or other capital stock or securities at the time issuable upon conversion of the Series Preferred) for the purpose of entitling or enabling them to receive any dividend or other distribution, or to receive any right to subscribe for or purchase any shares of capital stock of any class or any other securities, or to receive any other security;

(b) of any capital reorganization of the Corporation, any reclassification of the Common Stock of the Corporation, or any Deemed Liquidation Event; or

(c) of the voluntary or involuntary dissolution, liquidation or winding-up of the Corporation,

then, and in each such case, the Corporation will send or cause to be sent to the holders of the Series Preferred a notice specifying, as the case may be, (i) the record date for such dividend, distribution or right, and the amount and character of such dividend, distribution or right, or (ii) the effective date on which such reorganization, reclassification, consolidation, merger, transfer, dissolution, liquidation or winding-up is proposed to take place, and the time, if any is to be fixed, as of which the holders of record of Common Stock (or such other capital stock or securities at the time issuable upon the conversion of the Series Preferred) shall be entitled to exchange their shares of Common Stock (or such other capital stock or securities) for securities or other property deliverable upon such reorganization, reclassification, consolidation, merger, transfer, dissolution, liquidation or winding-up, and the amount per share and character of such exchange applicable to the Series Preferred and the Common Stock. Such notice shall be sent at least ten (10) days prior to the record date or effective date for the event specified in such notice.

5. Mandatory Conversion.

5.1 Trigger Events. Upon either (a) the closing of the sale of shares of Common Stock to the public (i) in which the price per share paid by the public (prior to the deduction of underwriting discounts and registration expenses) multiplied by the fully-diluted outstanding shares of the Corporation immediately prior to such closing (inclusive of options, warrants, other convertible securities and shares reserved under any equity plan) is no less than $150,000,000 and (ii) resulting in at least $30,000,000 in gross proceeds to the Corporation (prior to the deduction of underwriting discounts and registration expenses), in a firm-commitment underwritten public offering pursuant to an effective registration statement under the Securities Act of 1933, as amended (the "**Qualified IPO**"), or (b) the date and time, or the occurrence of an event, specified by vote or written consent of the Requisite Holders (the time of such closing or the date and time specified or the time of the event specified in such vote or written consent is referred to herein as the "**Mandatory Conversion Time**"), (i) all outstanding shares of Series Preferred shall automatically be converted into shares of Common Stock, at the then effective conversion rate and (ii) such shares may not be reissued by the Corporation.

5.2 Procedural Requirements. All holders of record of shares of Series Preferred shall be sent written notice of the Mandatory Conversion Time and the place designated for mandatory conversion of all such shares of Series Preferred pursuant to this Section 5. Such notice need not be sent in advance of the occurrence of the Mandatory Conversion Time. Upon receipt of such notice, each holder of shares of Series Preferred shall surrender his, her or its certificate or certificates for all such shares (or, if such holder alleges that such certificate has been lost, stolen or destroyed, a lost certificate affidavit and agreement reasonably acceptable to the Corporation to indemnify the Corporation against any claim that may be made against the Corporation on account of the alleged loss, theft or destruction of such certificate) to the Corporation at the place designated in such notice, and shall thereafter receive certificates for the number of shares of Common Stock to which such holder is entitled pursuant to this Section 5. At the Mandatory Conversion Time, all outstanding shares of Series Preferred shall be deemed to have been converted into shares of Common Stock, which shall be deemed to be outstanding of record, and all rights with respect to the Series Preferred so converted, including the rights, if any, to receive notices and vote (other than as a holder of Common Stock), will terminate, except only the rights of the holders thereof, upon surrender of their certificate or certificates (or lost certificate affidavit and agreement) therefor, to receive the items provided for in the last sentence of this Subsection 5.2. If so required by the Corporation, certificates surrendered for conversion shall be endorsed or accompanied by written instrument or instruments of transfer, in form reasonably satisfactory to the Corporation, duly executed by the registered holder or by his, her or its attorney duly authorized in writing. As soon as practicable after the Mandatory Conversion Time and the surrender of the certificate or certificates (or lost certificate affidavit and agreement) for Series Preferred, the Corporation shall issue and deliver to such holder, or to his, her or its nominees, a certificate or certificates for the number of full shares of Common Stock issuable on such conversion in accordance with the provisions hereof, together with cash as provided in Subsection 4.2 in lieu of any fraction of a share of Common Stock otherwise issuable upon such conversion.

5.3 Effect of Mandatory Conversion. All certificates evidencing shares of Series Preferred which are required to be surrendered for conversion in accordance with the provisions hereof shall, from and after the Mandatory Conversion Time, be deemed to have been retired and cancelled and the shares of Series Preferred represented thereby converted into Common Stock for all purposes, notwithstanding the failure of the holder or holders thereof to surrender such certificates on or prior to such date. Such converted Series Preferred may not be reissued as shares of such series, and the Corporation may thereafter take such appropriate action (without the need for stockholder action) as may be necessary to reduce the authorized number of shares of each such series of Series Preferred accordingly.

6. Redemption.

6.1 Request for Redemption. Subject to the terms and conditions of this Section 6 and the provisions of applicable law, the Corporation shall, (i) subject to the Corporation receiving any requisite consents from any applicable lending institutions, upon receiving a written request from LC (as defined in the Purchase Agreement) in the event that the Corporation has not received at least an aggregate of $15,000,000 of gross proceeds under the Purchase Agreement within 120 days after the filing of this Certificate of Incorporation, or (ii) upon receiving a written request at any time after December 31, 2021, signed by the holders of a

majority of the then outstanding shares of the Series D-1 Preferred Stock (the holders making such request in sub-clause (i) or (ii), as applicable, the "**Redeeming Holders**" and each of them, a "**Redeeming Holder**"), redeem, on the date three (3) months following the Corporation's receipt of such written redemption request (the "**Redemption Date**"), all of the Series D-1 Preferred Stock held by such Redeeming Holders that are outstanding on the date the Corporation receives such written redemption request to the extent that such outstanding shares of Series D-1 Preferred Stock have not been previously redeemed or converted into shares of Common Stock at least three (3) days prior to the Redemption Date. The shares of Series D-1 Preferred Stock called for redemption as provided above shall be redeemed in cash at the Redemption Price of such shares of Series D-1 Preferred Stock and such Redemption Price shall be paid from any source of funds legally available therefor, until (a) all outstanding shares of Series D-1 Preferred Stock to be redeemed have been redeemed or have been converted to shares of Common Stock as provided in Section 4 and Section 5 hereof or (b) the request for redemption has been withdrawn or terminated as provided below.

6.2 Withdrawal or Termination of Request. A redemption request may be withdrawn or terminated upon the request of a Redeeming Holder with respect to the shares of Series D-1 Preferred Stock held by such Redeeming Holder, but only with respect to the shares of Series D-1 Preferred Stock that had not been redeemed in full in cash as of the date such request for withdrawal or termination is made. After any such withdrawn or terminated redemption request, the shares of Series D-1 Preferred Stock subject thereto shall again be subject to redemption pursuant to Section 6.1 hereof.

6.3 Redemption Price. The redemption price for each share of Series D-1 Preferred Stock (the "**Redemption Price**") shall equal an amount in cash equal to the higher of (i) the Original Issue Price for the Series D-1 Preferred Stock plus all declared but unpaid dividends on such Series D-1 Preferred Stock up to the Redemption Date and (ii) the fair market value of the share of Series D-1 Preferred Stock, the valuation of which shall be determined by an independent appraisal (exclusive of any liquidity or minority ownership discounts) conducted by an independent third party valuation firm mutually agreed by the Redeeming Holders and the Corporation.

6.4 Insufficient Legally Available Funds. Notwithstanding any other provision set forth in this Section 6, if upon any Redemption Date scheduled for the redemption of shares of Series D-1 Preferred Stock, the funds and assets of the Corporation legally available to redeem such shares of Series D-1 Preferred Stock shall be insufficient to redeem all such shares of Series D-1 Preferred Stock then scheduled to be redeemed, then:

(a) the holders of such shares of Series D-1 Preferred Stock to be redeemed shall share ratably in any redemption in proportion to the respective Redemption Prices that would otherwise be payable in respect of such shares of Series D-1 Preferred Stock held by them upon such redemption if all amounts payable on or with respect to such shares of Series D-1 Preferred Stock were paid in full; and

(b) any unredeemed shares of Series D-1 Preferred Stock shall be carried forward and shall be redeemed (together with any other shares of Series D-1 Preferred Stock then scheduled to be redeemed) at the next such scheduled Redemption Date determined

by the Redeeming Holders to the full extent of legally available funds of the Corporation at such time.

Any such unredeemed shares of Series D-1 Preferred Stock shall continue to be so carried forward until redeemed and shall continue to be outstanding and entitled to all dividend, liquidation, conversion and other rights, powers and preferences of the Series D-1 Preferred Stock respectively until three (3) days prior to the Redemption Date upon which such shares of Series D-1 Preferred Stock are to be redeemed.

6.5 Redemption Notice. At least twenty (20) but no more than sixty (60) days prior to the initial Redemption Date for the shares of Series D-1 Preferred Stock, written notice in accordance with the provisions of Section 9 hereof shall be mailed by the Corporation to each Redeeming Holder, notifying such Redeeming Holder of (a) the redemption to be effected, (b) specifying the Redemption Date(s), the applicable Redemption Price, the number of shares of Series D-1 Preferred Stock held by such Redeeming Holder to be redeemed, the place at which payment may be obtained and the date on which such Redeeming Holder's Conversion Rights as to such shares of Series D-1 Preferred Stock terminate (which date shall be three (3) days prior to each Redemption Date with respect to the shares of Series D-1 Preferred Stock to be redeemed on that date) and (c) calling upon such Redeeming Holder to surrender to the Corporation, in the manner and at the place designated, the certificate or certificates representing the shares of Series D-1 Preferred Stock to be redeemed (the "**Redemption Notice**"). At least thirty (30) days prior to the Redemption Date, written notice in accordance with the provisions of Section 9 hereof shall be mailed by the Corporation to each holder of Series D-1 Preferred Stock that is not at such time a Redeeming Holder, (a) notifying each such holder of the redemption to be effected, (b) specifying the Redemption Date(s), the applicable Redemption Price, the number of shares of Series D-1 Preferred Stock held by such holder that are eligible to be redeemed if such holder elects to participate in such redemption, the place at which payment may be obtained and the date on which such holder's Conversion Rights as to such shares of Series D-1 Preferred Stock terminate if such holder elects to participate in the redemption (which date shall be three (3) days prior to each Redemption Date with respect to the shares of Series D-1 Preferred Stock to be redeemed on that date), (c) providing such holder the opportunity to notify the Corporation within fifteen (15) days after the date of such notice if such holder elects to participate in the redemption, in which case the holder shall thereafter be deemed a Redeeming Holder, and (d) to the extent such holder elects to participation in the redemption, calling upon such holder to surrender to the Corporation, in the manner and at the place designated, the certificate or certificates representing the shares of Series D-1 Preferred Stock to be redeemed.

6.6 Surrender of Certificates. On or before each designated Redemption Date, each Redeeming Holder shall (unless such Redeeming Holder has previously exercised the right to convert such shares of Series D-1 Preferred Stock into shares of Common Stock as provided in Section 4 hereof), surrender the certificate(s) representing such shares of Series D-1 Preferred Stock to be redeemed to the Corporation (or, if such Redeeming Holder alleges that any such certificate has been lost, stolen or destroyed, a lost certificate affidavit), in the manner and at the place designated in the Redemption Notice, and thereupon the Redemption Price for such shares of Series D-1 Preferred Stock shall be payable to the order of the person whose name appears on such certificate(s) as the owner thereof, and each surrendered certificate shall be cancelled and retired. If less than all of the shares of Series D-1 Preferred Stock represented by such certificate

are redeemed, then the Corporation shall promptly issue a new certificate representing the unredeemed shares of Series D-1 Preferred Stock.

6.7 Effect of Redemption. If the Redemption Notice shall have been duly given to each Redeeming Holder, and if on any Redemption Date the Redemption Price for the shares of Series D-1 Preferred Stock to be redeemed thereon is either paid or made available for payment through the deposit arrangements specified in Section 6.8 hereof, then notwithstanding that the certificates evidencing any of the such shares of Series D-1 Preferred Stock so called for redemption on such Redemption Date shall not have been surrendered, such shares of Series D-1 Preferred Stock shall not thereafter be transferred on the Corporation's books and the rights of all of the holders of such shares of Series D-1 Preferred Stock with respect to such shares of Series D-1 Preferred Stock shall terminate on such Redemption Date, except only the right of the holders to receive the Redemption Price from the Corporation or the payment agent, without interest, upon surrender of their certificate(s) therefor (or, if such holder alleges that any such certificate has been lost, stolen or destroyed, a lost certificate affidavit).

6.8 Deposit of Redemption Price. On or prior to the Redemption Date for any shares of Series D-1 Preferred Stock, the Corporation may, at its option, deposit with an independent payment agent, a sum equal to the aggregate Redemption Price for the shares of Series D-1 Preferred Stock called for redemption on that Redemption Date and not yet redeemed, with irrevocable instructions and authority to the payment agent to pay, on or after the Redemption Date, the Redemption Price to the respective holders upon the surrender of their share certificates (or, if such holder alleges that any such certificate has been lost, stolen or destroyed, a lost certificate affidavit). The deposit shall constitute full payment of the shares of Series D-1 Preferred Stock called for redemption on that Redemption Date to their holders, and from and after such Redemption Date, such shares of Series D-1 Preferred Stock shall be deemed to be redeemed and no longer outstanding. Any funds so deposited and unclaimed at the end of one (1) year from such Redemption Date shall be released or repaid to the Corporation, after which time the holders of shares of Series D-1 Preferred Stock called for redemption who have not claimed such funds shall be entitled to receive payment of the Redemption Price only from the Corporation.

7. Redeemed or Otherwise Acquired Shares. Any shares of Series Preferred which are redeemed or otherwise acquired by the Corporation or any of its subsidiaries shall be automatically and immediately cancelled and retired and shall not be reissued, sold or transferred. Neither the Corporation nor any of its subsidiaries may exercise any voting or other rights granted to the holders of Series Preferred following redemption.

8. Waiver. Any of the rights, powers, preferences and other terms of the Series Preferred set forth herein may be waived on behalf of all holders of Series Preferred by the affirmative consent or vote of the Requisite Holders.

9. Notices. Any notice required or permitted by the provisions of this Article Fourth to be given to a holder of shares of Series Preferred shall be mailed, postage prepaid, to the post office address last shown on the records of the Corporation, or given by electronic communication in compliance with the provisions of the General Corporation Law, and shall be deemed sent upon such mailing or electronic transmission.

FIFTH: The Corporation will not, by amendment of this Certificate of Incorporation or through any reorganization, transfer of capital stock or assets, consolidation, merger, dissolution, issue of securities or any other voluntary action, avoid or seek to avoid the observance or performance of any of the terms of the Series Preferred set forth herein, but will at all times in good faith assist in the carrying out of all such terms. Without limiting the generality of the foregoing, the Corporation (a) will not increase the par value of any shares of stock receivable on the conversion of the Series Preferred above the applicable Original Issue Price and (b) will take such action as may be necessary or appropriate in order that the Corporation may validly and legally issue fully-paid and nonassessable shares of stock on the conversion of the Series Preferred from time to time outstanding.

SIXTH: Subject to any additional vote required by this Certificate of Incorporation, in furtherance and not in limitation of the powers conferred by statute, the Board is expressly authorized to make, repeal, alter, amend and rescind any or all of the Bylaws of the Corporation.

SEVENTH: Elections of directors need not be by written ballot unless the Bylaws of the Corporation shall so provide.

EIGHTH: Meetings of stockholders may be held within or without the State of Delaware, as the Bylaws of the Corporation may provide. The books and records of the Corporation may be kept outside the State of Delaware at such place or places as may be designated from time to time by the Board or in the Bylaws of the Corporation.

NINTH: To the fullest extent permitted by law, a director of the Corporation shall not be personally liable to the Corporation or its stockholders for monetary damages for breach of fiduciary duty as a director. If the General Corporation Law or any other law of the State of Delaware is amended after approval by the stockholders of this Article Ninth to authorize corporate action further eliminating or limiting the personal liability of directors, then the liability of a director of the Corporation shall be eliminated or limited to the fullest extent permitted by the General Corporation Law.

Any repeal or modification of the foregoing provisions of this Article Ninth by the stockholders of the Corporation shall not adversely affect any right or protection of a director of the Corporation existing at the time of, or increase the liability of any director of the Corporation with respect to any acts or omissions of such director occurring prior to, such repeal or modification.

TENTH: The Corporation shall, to the maximum extent permitted from time to time under applicable law, indemnify and hold harmless, and upon request shall advance expenses to any person who is or was a party or is threatened to be made a party to any threatened, pending or completed action, suit, proceeding or claim, whether civil, criminal, administrative or investigative, by reason of the fact that such person is or was or has agreed to be a director or officer of the Corporation or while a director or officer is or was serving at the request of the Corporation as a director, officer, employee or agent of any other corporation, partnership, joint venture, trust or other enterprise, including service with respect to employee benefit plans, against any and all expenses (including attorney’s fees and expenses), judgments,

fines, penalties and amounts paid in settlement or incurred in connection with the investigation, preparation to defend or defense of such action, suit, proceeding or claim. Such rights arising under any bylaw, agreement, vote of directors or stockholders or otherwise shall inure to the benefit of the heirs and legal representatives of such person.

The Corporation hereby acknowledges that, to the extent a director is serving on the Board at the direction of a stockholder who owns shares of Series Preferred (an "**Investor**"), such director may have certain rights to indemnification, advancement of expenses and/or insurance provided by the Investor and/or certain of their affiliates (collectively, the "**Investor Indemnitors**"). The Corporation hereby agrees (i) that it is the indemnitor of first resort (i.e., its obligations to such director are primary and any obligation of the Investor Indemnitors to advance expenses or to provide indemnification for the same expenses or liabilities incurred by such director are secondary); (ii) that it shall be required to advance the full amount of expenses incurred by such director and shall be liable for the full amount of all expenses to the extent legally permitted and as required by the terms of this Certificate of Incorporation or the Bylaws of the Corporation, as amended (or any agreement between the Corporation and such director), without regard to any rights such director may have against the Investor Indemnitors; and, (iii) that it irrevocably waives, relinquishes and releases the Investor Indemnitors from any and all claims against the Investor Indemnitors for contribution, subrogation or any other recovery of any kind in respect thereof. The Corporation further agrees that no advancement or payment by the Investor Indemnitors on behalf of such director with respect to any claim for which such director has sought indemnification from the Corporation shall affect the foregoing and the Investor Indemnitors shall have a right of contribution and/or be subrogated to the extent of such advancement or payment to all of the rights of recovery of such director against the Corporation.

Any amendment, repeal or modification of the foregoing provisions of this Article Tenth shall not adversely affect any right or protection of any director, officer or other agent of the Corporation existing at the time of such amendment, repeal or modification.

ELEVENTH: The Corporation renounces any interest or expectancy of the Corporation 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 Corporation who is not an employee of the Corporation or any of its subsidiaries, or (ii) any holder of Series Preferred or any partner, member, director, manager, stockholder, employee or agent of any such holder, other than someone who is an employee of the Corporation or any of its subsidiaries (collectively, "**Covered Persons**"), unless such matter, transaction or interest was presented to, or acquired, created or developed by, or otherwise came into the possession of, a Covered Person expressly and solely in such Covered Person's capacity as a director of the Corporation. No amendment, repeal or modification of this Article Eleventh shall apply to or have any effect on the liability or alleged liability of any officer, director or stockholder of the Corporation for or with respect to any opportunities which such officer, director or stockholder becomes aware prior to such amendment, modification or repeal.

TWELFTH: For purposes of Section 500 of the California Corporations Code (to the extent applicable), in connection with any repurchase of shares of Common Stock permitted under this Certificate of Incorporation from employees, officers, directors or

consultants of the Corporation in connection with a termination of employment or services pursuant to agreements or arrangements approved by the Board (in addition to any other consent required under this Certificate of Incorporation), such repurchase may be made without regard to any "preferential dividends arrears amount" or "preferential rights amount" (as those terms are defined in Section 500 of the California Corporations Code). Accordingly, for purposes of making any calculation under California Corporations Code Section 500 in connection with such repurchase, the amount of any "preferential dividends arrears amount" or "preferential rights amount" (as those terms are defined therein) shall be deemed to be zero (0).

* * *

3: That the foregoing amendment and restatement was approved by the holders of the requisite number of shares of the Corporation in accordance with Section 228 of the General Corporation Law.

4: That this Certificate of Incorporation, which restates and integrates and further amends the provisions of the Restated Certificate, has been duly adopted in accordance with Sections 242 and 245 of the General Corporation Law.

IN WITNESS WHEREOF, this Eighth Amended and Restated Certificate of Incorporation has been executed by a duly authorized officer of this corporation on August 4, 2016.

By: /s/ Erik Holmlin
Name: Erik Holmlin
Title: Chief Executive Officer

FIRST CERTIFICATE OF AMENDMENT
TO EIGHTH AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
BIONANO GENOMICS, INC.

BioNano Genomics, Inc. (the "***Corporation***"), a corporation organized and existing under and by virtue of the General Corporation Law of the State of Delaware (the "***DGCL***"), hereby certifies that:

1. The name of the Corporation is BioNano Genomics, Inc. The Corporation's Certificate of Incorporation was originally filed with the Secretary of State of the State of Delaware on August 16, 2007 under the name of BioNanomatrix, Inc.

2. The Eighth Amended and Restated Certificate of Incorporation of the Corporation (the "***Charter***") was filed with the Secretary of State of the State of Delaware on August 4, 2016.

3. The Board of Directors of the Corporation (the "***Board***"), acting in accordance with the provisions of Sections 141 and 242 of the DGCL, duly adopted resolutions amending the Charter as follows:

The first sentence of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"**FOURTH:** The total number of shares of all classes of stock which the Corporation shall have authority to issue is (i) 190,559,820 shares of Common Stock, $0.0001 par value per share ("**Common Stock**") and (ii) 165,444,677 shares of Preferred Stock, par value $0.0001 per share, 418,767 shares of which are designated "Series A Convertible Participating Preferred Stock" (the "**Series A Preferred Stock**"), 8,101,042 shares of which are designated "Series B Convertible Participating Preferred Stock" (the "**Series B Preferred Stock**"), 7,523,734 shares of which are designated "Series B-1 Convertible Participating Preferred Stock" (the "**Series B-1 Preferred Stock**" and together with the Series B Preferred Stock, the "**Series B/B-1 Preferred Stock**,"), 23,357,047 shares of which are designated "Series C Convertible Participating Preferred Stock" (the "**Series C Preferred Stock**"), 52,835,720 shares of which are designated "Series D Convertible Participating Preferred Stock" (the "**Series D Preferred Stock**"), and 73,208,367 shares of which are designated "Series D-1 Convertible Participating Preferred Stock" (the "**Series D-1 Preferred Stock**" and, together with the Series A Preferred Stock, the Series B/B-1 Preferred Stock, the Series C Preferred Stock, and the Series D Preferred Stock, the "**Series Preferred**")."

4. Thereafter, pursuant to a resolution of the Board, this First Certificate of Amendment was submitted to the stockholders of the Corporation for their approval, and was duly adopted in accordance with Sections 228 and 242 of the DGCL.

5. All other provisions of the Eighth Amended and Restated Certificate of Incorporation of the Corporation, as currently on file with the Secretary of State of the State of Delaware, shall remain in full force and effect.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the Corporation has caused this First Certificate of Amendment to be signed by its Chief Executive Officer this 9th day of December, 2016.

/s/ R. Erik Holmlin

Name: R. Erik Holmlin
Title: Chief Executive Officer

SECOND CERTIFICATE OF AMENDMENT
TO EIGHTH AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
BIONANO GENOMICS, INC.

BioNano Genomics, Inc. (the "***Corporation***"), a corporation organized and existing under and by virtue of the General Corporation Law of the State of Delaware (the "***DGCL***"), hereby certifies that:

1. The name of the Corporation is BioNano Genomics, Inc. The Corporation's Certificate of Incorporation was originally filed with the Secretary of State of the State of Delaware on August 16, 2007 under the name of BioNanomatrix, Inc.

2. The Eighth Amended and Restated Certificate of Incorporation of the Corporation (the "***Charter***") was filed with the Secretary of State of the State of Delaware on August 4, 2016.

3. The Board of Directors of the Corporation (the "***Board***"), acting in accordance with the provisions of Sections 141 and 242 of the DGCL, duly adopted resolutions amending the Charter as follows:

(i) The first sentence of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"**FOURTH:** The total number of shares of all classes of stock which the Corporation shall have authority to issue is (i) 211,393,220 shares of Common Stock, $0.0001 par value per share ("**Common Stock**") and (ii) 186,278,077 shares of Preferred Stock, par value $0.0001 per share, 418,767 shares of which are designated "Series A Convertible Participating Preferred Stock" (the "**Series A Preferred Stock**"), 8,101,042 shares of which are designated "Series B Convertible Participating Preferred Stock" (the "**Series B Preferred Stock**"), 7,523,734 shares of which are designated "Series B-1 Convertible Participating Preferred Stock" (the "**Series B-1 Preferred Stock**" and together with the Series B Preferred Stock, the "**Series B/B-1 Preferred Stock**,"), 23,357,047 shares of which are designated "Series C Convertible Participating Preferred Stock" (the "**Series C Preferred Stock**"), 52,835,720 shares of which are designated "Series D Convertible Participating Preferred Stock" (the "**Series D Preferred Stock**"), and 94,041,767 shares of which are designated "Series D-1 Convertible Participating Preferred Stock" (the "**Series D-1 Preferred Stock**" and, together with the Series A Preferred Stock, the Series B/B-1 Preferred Stock, the Series C Preferred Stock, and the Series D Preferred Stock, the "**Series Preferred**")."

(ii) The Last Paragraph of Article FOURTH, Section B.2.3.1 is hereby amended and restated in its entirety as follows:

"Notwithstanding anything to the contrary herein, the sale of shares of Series D-1 Preferred Stock by the Corporation under that certain Series D-1 Convertible Participating Preferred Stock Purchase Agreement, dated on or about the date hereof, by and among the Corporation and the Purchasers set forth on Exhibit A thereto (as the same may be amended from time to time, the "**Purchase Agreement**") shall not in any circumstances be considered a "Deemed Liquidation Event."

4. Thereafter, pursuant to a resolution of the Board, this Second Certificate of Amendment was submitted to the stockholders of the Corporation for their approval, and was duly adopted in accordance with Sections 228 and 242 of the DGCL.

5. All other provisions of the Charter, as amended to date and as currently on file with the Secretary of State of the State of Delaware, shall remain in full force and effect.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the Corporation has caused this Second Certificate of Amendment to be signed by its Chief Executive Officer this 25th day of January, 2017.

/s/ R. Erik Holmlin

Name: R. Erik Holmlin
Title: Chief Executive Officer

THIRD CERTIFICATE OF AMENDMENT
TO EIGHTH AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
BIONANO GENOMICS, INC.

BioNano Genomics, Inc. (the "***Corporation***"), a corporation organized and existing under and by virtue of the General Corporation Law of the State of Delaware (the "***DGCL***"), hereby certifies that:

1. The name of the Corporation is BioNano Genomics, Inc. The Corporation's Certificate of Incorporation was originally filed with the Secretary of State of the State of Delaware on August 16, 2007 under the name of BioNanomatrix, Inc.

2. The Eighth Amended and Restated Certificate of Incorporation of the Corporation (the "***Charter***") was filed with the Secretary of State of the State of Delaware on August 4, 2016.

3. The Board of Directors of the Corporation (the "***Board***"), acting in accordance with the provisions of Sections 141 and 242 of the DGCL, duly adopted resolutions amending the Charter as follows:

(i) The first sentence of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"**FOURTH:** The total number of shares of all classes of stock which the Corporation shall have authority to issue is (i) 243,160,120 shares of Common Stock, $0.0001 par value per share ("**Common Stock**") and (ii) 218,044,977 shares of Preferred Stock, par value $0.0001 per share, 418,767 shares of which are designated "Series A Convertible Participating Preferred Stock" (the "**Series A Preferred Stock**"), 8,101,042 shares of which are designated "Series B Convertible Participating Preferred Stock" (the "**Series B Preferred Stock**"), 7,523,734 shares of which are designated "Series B-1 Convertible Participating Preferred Stock" (the "**Series B-1 Preferred Stock**" and together with the Series B Preferred Stock, the "**Series B/B-1 Preferred Stock**,"), 23,357,047 shares of which are designated "Series C Convertible Participating Preferred Stock" (the "**Series C Preferred Stock**"), 52,835,720 shares of which are designated "Series D Convertible Participating Preferred Stock" (the "**Series D Preferred Stock**"), and 125,808,667 shares of which are designated "Series D-1 Convertible Participating Preferred Stock" (the "**Series D-1 Preferred Stock**" and, together with the Series A Preferred Stock, the Series B/B-1 Preferred Stock, the Series C Preferred Stock, and the Series D Preferred Stock, the "**Series Preferred**")."

4. Thereafter, pursuant to a resolution of the Board, this Third Certificate of Amendment was submitted to the stockholders of the Corporation for their approval, and was duly adopted in accordance with Sections 228 and 242 of the DGCL.

5. All other provisions of the Charter, as amended to date and as currently on file with the Secretary of State of the State of Delaware, shall remain in full force and effect.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the Corporation has caused this Third Certificate of Amendment to be signed by its Chief Executive Officer this 17th day of November, 2017.

/s/ R. Erik Holmlin

Name: R. Erik Holmlin
Title: Chief Executive Officer

FOURTH CERTIFICATE OF AMENDMENT
TO EIGHTH AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
BIONANO GENOMICS, INC.

BioNano Genomics, Inc. (the "***Corporation***"), a corporation organized and existing under and by virtue of the General Corporation Law of the State of Delaware (the "***DGCL***"), hereby certifies that:

1. The name of the Corporation is BioNano Genomics, Inc. The Corporation's Certificate of Incorporation was originally filed with the Secretary of State of the State of Delaware on August 16, 2007 under the name of BioNanomatrix, Inc.

2. The Eighth Amended and Restated Certificate of Incorporation of the Corporation (the "***Charter***") was filed with the Secretary of State of the State of Delaware on August 4, 2016.

3. The Board of Directors of the Corporation (the "***Board***"), acting in accordance with the provisions of Sections 141 and 242 of the DGCL, duly adopted resolutions amending the Charter as follows:

(i) The first sentence of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"The total number of shares of all classes of stock which the Corporation shall have authority to issue is (i) 244,097,620 shares of Common Stock, $0.0001 par value per share ("**Common Stock**") and (ii) 218,982,477 shares of Preferred Stock, par value $0.0001 per share, 418,767 shares of which are designated "Series A Convertible Participating Preferred Stock" (the "**Series A Preferred Stock**"), 8,101,042 shares of which are designated "Series B Convertible Participating Preferred Stock" (the "**Series B Preferred Stock**"), 7,523,734 shares of which are designated "Series B-1 Convertible Participating Preferred Stock" (the "**Series B-1 Preferred Stock**" and together with the Series B Preferred Stock, the "**Series B/B-1 Preferred Stock**,"), 23,357,047 shares of which are designated "Series C Convertible Participating Preferred Stock" (the "**Series C Preferred Stock**"), 52,835,720 shares of which are designated "Series D Convertible Participating Preferred Stock" (the "**Series D Preferred Stock**"), and 126,746,167 shares of which are designated "Series D-1 Convertible Participating Preferred Stock" (the "**Series D-1 Preferred Stock**" and, together with the Series A Preferred Stock, the Series B/B-1 Preferred Stock, the Series C Preferred Stock, and the Series D Preferred Stock, the "**Series Preferred**")."

(ii) The first sentence of Section 6.1 of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"Subject to the terms and conditions of this Section 6 and the provisions of applicable law, the Corporation shall, (i) subject to the Corporation receiving any requisite consents from any applicable lending institutions, upon receiving a written request from LC (as defined in the Purchase Agreement) in the event that the Corporation has not received at least an aggregate of $15,000,000 of gross proceeds under the Purchase Agreement within 120 days after the filing of this Certificate of Incorporation, or (ii) subject to the

Corporation receiving any requisite consents from any applicable lending institutions, upon receiving a written request at any time after December 31, 2021, signed by the holders of a majority of the then outstanding shares of the Series D-1 Preferred Stock (the holders making such request in sub-clause (i) or (ii), as applicable, the "**Redeeming Holders**" and each of them, a "**Redeeming Holder**"), redeem, on the date three (3) months following the Corporation's receipt of such written redemption request (the "**Redemption Date**"), all of the Series D-1 Preferred Stock held by such Redeeming Holders that are outstanding on the date the Corporation receives such written redemption request to the extent that such outstanding shares of Series D-1 Preferred Stock have not been previously redeemed or converted into shares of Common Stock at least three (3) days prior to the Redemption Date."

4. Thereafter, pursuant to a resolution of the Board, this Fourth Certificate of Amendment was submitted to the stockholders of the Corporation for their approval, and was duly adopted in accordance with Sections 228 and 242 of the DGCL.

5. All other provisions of the Charter, as amended to date and as currently on file with the Secretary of State of the State of Delaware, shall remain in full force and effect.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the Corporation has caused this Fourth Certificate of Amendment to be signed by its Chief Executive Officer this 29th day of June, 2018.

/s/ R. Erik Holmlin

Name: R. Erik Holmlin
Title: Chief Executive Officer

FIFTH CERTIFICATE OF AMENDMENT
TO EIGHTH AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
BIONANO GENOMICS, INC.

BioNano Genomics, Inc. (the "***Corporation***"), a corporation organized and existing under and by virtue of the General Corporation Law of the State of Delaware (the "***DGCL***"), hereby certifies that:

1. The name of the Corporation is BioNano Genomics, Inc. The Corporation's Certificate of Incorporation was originally filed with the Secretary of State of the State of Delaware on August 16, 2007 under the name of BioNanomatrix, Inc.

2. The Eighth Amended and Restated Certificate of Incorporation of the Corporation (the "***Charter***") was filed with the Secretary of State of the State of Delaware on August 4, 2016.

3. The Board of Directors of the Corporation (the "***Board***"), acting in accordance with the provisions of Sections 141 and 242 of the DGCL, duly adopted resolutions amending the Charter as follows:

(i) The first sentence of Article ONE of the Charter is hereby amended and restated in its entirety as follows:

"The name of the Corporation is Bionano Genomics, Inc."

(ii) The second paragraph of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"Effective immediately upon the Fifth Certificate of Amendment to this Certificate of Incorporation becoming effective under the General Corporation Law, and without any further action by the holders of such shares, every 21.4 outstanding shares of Common Stock shall automatically combine into and become one validly issued, fully paid and non-assessable share of Common Stock (the "**Reverse Stock Split**"). No fractional shares of Common Stock shall be issued upon the Reverse Stock Split. The Reverse Stock Split shall be effected on a record holder-by-record holder basis, such that any fractional shares of Common Stock resulting from the Reverse Stock Split and held by a single record holder shall be aggregated. If the Reverse Stock Split would result in the issuance of any fractional share, the Corporation 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 by the Board) on the date that the Reverse Stock Split is effective, rounded up to the nearest whole cent. The par value of each share of Common Stock shall not be adjusted in connection with the Reverse Stock Split. All of the outstanding share amounts, amounts per share and per share numbers in this Certificate of Incorporation shall be appropriately adjusted to give effect to the Reverse Stock Split."

(iii) The first sentence of Section 3.2 of Part B of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"The number of directors constituting the Board shall be eight (8)."

(iv) The first sentence of Section 3.2.1 of Part B of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"For so long as any shares of Series D-1 Preferred Stock remain outstanding, the holders of Series D-1 Preferred Stock shall be entitled to elect one (1) member of the Board at each meeting or pursuant to each consent of the Corporation's stockholders for the election of directors."

(v) Section 5.1 of Part B of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"Upon either (a) the closing of the sale of shares of Common Stock to the public (i) in which the price per share paid by the public (prior to the deduction of underwriting discounts and registration expenses) is no less than $6.00 per share (as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares effectuated after July 16, 2018) and (ii) resulting in at least $25,000,000 in gross proceeds to the Corporation (prior to the deduction of underwriting discounts and registration expenses), in a firm-commitment underwritten public offering pursuant to an effective registration statement under the Securities Act of 1933, as amended (the "**Qualified IPO**"), or (b) the date and time, or the occurrence of an event, specified by vote or written consent of the Requisite Holders (the time of such closing or the date and time specified or the time of the event specified in such vote or written consent is referred to herein as the "**Mandatory Conversion Time**"), (i) all outstanding shares of Series Preferred shall automatically be converted into shares of Common Stock, at the then effective conversion rate and (ii) such shares may not be reissued by the Corporation."

4. Thereafter, pursuant to a resolution of the Board, this Fifth Certificate of Amendment was submitted to the stockholders of the Corporation for their approval, and was duly adopted in accordance with Sections 228 and 242 of the DGCL.

5. All other provisions of the Charter, as amended to date and as currently on file with the Secretary of State of the State of Delaware, shall remain in full force and effect.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the Corporation has caused this Fifth Certificate of Amendment to be signed by its Chief Executive Officer this 16th day of July, 2018.

/s/ R. Erik Holmlin

Name: R. Erik Holmlin
Title: Chief Executive Officer

SIXTH CERTIFICATE OF AMENDMENT
TO EIGHTH AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
BIONANO GENOMICS, INC.

Bionano Genomics, Inc. (the "***Corporation***"), a corporation organized and existing under and by virtue of the General Corporation Law of the State of Delaware (the "***DGCL***"), hereby certifies that:

1. The name of the Corporation is Bionano Genomics, Inc. The Corporation's Certificate of Incorporation was originally filed with the Secretary of State of the State of Delaware on August 16, 2007 under the name of BioNanomatrix, Inc.

2. The Eighth Amended and Restated Certificate of Incorporation of the Corporation (the "***Charter***") was filed with the Secretary of State of the State of Delaware on August 4, 2016.

3. The Board of Directors of the Corporation (the "***Board***"), acting in accordance with the provisions of Sections 141 and 242 of the DGCL, duly adopted resolutions amending the Charter as follows:

(i) Section 5.1 of Part B of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"Upon either (a) the closing of the sale of shares of Common Stock to the public (i) in which the price per share paid by the public (prior to the deduction of underwriting discounts and registration expenses) is no less than $5.00 per share (as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares effectuated after July 16, 2018) and (ii) resulting in at least $25,000,000 in gross proceeds to the Corporation (prior to the deduction of underwriting discounts and registration expenses), in a firm-commitment underwritten public offering pursuant to an effective registration statement under the Securities Act of 1933, as amended (the "**Qualified IPO**"), or (b) the date and time, or the occurrence of an event, specified by vote or written consent of the Requisite Holders (the time of such closing or the date and time specified or the time of the event specified in such vote or written consent is referred to herein as the "**Mandatory Conversion Time**"), (i) all outstanding shares of Series Preferred shall automatically be converted into shares of Common Stock, at the then effective conversion rate and (ii) such shares may not be reissued by the Corporation."

4. Thereafter, pursuant to a resolution of the Board, this Sixth Certificate of Amendment was submitted to the stockholders of the Corporation for their approval, and was duly adopted in accordance with Sections 228 and 242 of the DGCL.

5. All other provisions of the Charter, as amended to date and as currently on file with the Secretary of State of the State of Delaware, shall remain in full force and effect.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the Corporation has caused this Sixth Certificate of Amendment to be signed by its Chief Executive Officer this 31st day of July, 2018.

/s/ R. Erik Holmlin
Name: R. Erik Holmlin
Title: Chief Executive Officer

SEVENTH CERTIFICATE OF AMENDMENT
TO EIGHTH AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
BIONANO GENOMICS, INC.

Bionano Genomics, Inc. (the "***Corporation***"), a corporation organized and existing under and by virtue of the General Corporation Law of the State of Delaware (the "***DGCL***"), hereby certifies that:

1. The name of the Corporation is Bionano Genomics, Inc. The Corporation's Certificate of Incorporation was originally filed with the Secretary of State of the State of Delaware on August 16, 2007 under the name of BioNanomatrix, Inc.

2. The Eighth Amended and Restated Certificate of Incorporation of the Corporation (the "***Charter***") was filed with the Secretary of State of the State of Delaware on August 4, 2016.

3. The Board of Directors of the Corporation (the "***Board***"), acting in accordance with the provisions of Sections 141 and 242 of the DGCL, duly adopted resolutions amending the Charter as follows:

(i) The second paragraph of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"Effective at the time of filing of this Certificate of Incorporation with the Secretary of State of the State of Delaware on August 4, 2016, every ten (10) shares of Common Stock issued and outstanding shall, automatically and without any action on the part of the respective holder thereof, be converted, combined into and shall become one (1) share of Common Stock without increasing or decreasing the par value of each share of Common Stock (the "**First Reverse Stock Split**"); provided, however, that the Corporation shall issue no fractional shares of Common Stock as a result of the First Reverse Stock Split, but shall instead pay to any stockholder who would be entitled to receive a fractional share as a result of the actions set forth herein a sum in cash equal to the fair market value of the shares constituting such fractional share as determined in good faith by the Board. The First Reverse Stock Split shall occur whether or not the certificates representing such shares of Common Stock are surrendered to the Corporation or its transfer agent. The First Reverse Stock Split shall be effected on a record holder-by-record holder basis, such that any fractional shares of Common Stock resulting from the First Reverse Stock Split and held by a single record holder shall be aggregated. All amounts in this Certificate of Incorporation have been adjusted to reflect the First Reverse Stock Split. All certificates representing shares of Common Stock outstanding immediately prior to the filing of this Certificate of Incorporation shall immediately after the filing of this Certificate of Incorporation represent a number of shares of Common Stock as adjusted to reflect the First Reverse Stock Split.

Effective immediately upon the Fifth Certificate of Amendment to this Certificate of Incorporation becoming effective under the General Corporation Law, and without any further action by the holders of such shares, every 21.4 outstanding shares of Common Stock shall automatically combine into and become one validly issued, fully paid and non-assessable share of Common Stock (the "**Second Reverse Stock Split**"). No fractional shares of Common Stock shall be issued upon the Second Reverse Stock Split. The Second

Reverse Stock Split shall be effected on a record holder-by-record holder basis, such that any fractional shares of Common Stock resulting from the Second Reverse Stock Split and held by a single record holder shall be aggregated. If the Second Reverse Stock Split would result in the issuance of any fractional share, the Corporation 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 by the Board) on the date that the Second Reverse Stock Split is effective, rounded up to the nearest whole cent. The par value of each share of Common Stock shall not be adjusted in connection with the Second Reverse Stock Split. All of the outstanding share amounts, amounts per share and per share numbers in this Certificate of Incorporation shall be appropriately adjusted to give effect to the Second Reverse Stock Split.

Effective immediately upon the Seventh Certificate of Amendment to this Certificate of Incorporation becoming effective under the General Corporation Law, and without any further action by the holders of such shares, every two outstanding shares of Common Stock shall automatically combine into and become one validly issued, fully paid and non-assessable share of Common Stock (the "**Third Reverse Stock Split**"). No fractional shares of Common Stock shall be issued upon the Third Reverse Stock Split. The Third Reverse Stock Split shall be effected on a record holder-by-record holder basis, such that any fractional shares of Common Stock resulting from the Third Reverse Stock Split and held by a single record holder shall be aggregated. If the Third Reverse Stock Split would result in the issuance of any fractional share, the Corporation 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 by the Board) on the date that the Third Reverse Stock Split is effective, rounded up to the nearest whole cent. The par value of each share of Common Stock shall not be adjusted in connection with the Third Reverse Stock Split. All of the outstanding share amounts, amounts per share and per share numbers in this Certificate of Incorporation shall be appropriately adjusted to give effect to the Third Reverse Stock Split."

(ii) Section 5.1 of Part B of Article FOURTH of the Charter is hereby amended and restated in its entirety as follows:

"Upon either (a) the closing of the sale to the public of either shares of Common Stock or units comprised of shares of Common Stock and warrants to purchase shares of Common Stock ("**Units**") (i) in which the price per share paid by the public (prior to the deduction of underwriting discounts and registration expenses) is no less than $6.00 per share, or to the extent Units are sold in such offering, no less than $6.00 per Unit (in each case as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to shares of Common Stock effectuated after August 15, 2018), in each case in the initial closing of the such offering, and (ii) resulting in at least $15,000,000 in gross proceeds to the Corporation (prior to the deduction of underwriting discounts and registration expenses), in a firm-commitment underwritten public offering pursuant to an effective registration statement under the Securities Act of 1933, as amended (the "**Qualified IPO**"), or (b) the date and time, or the occurrence of an event, specified by vote or written consent of the Requisite Holders (the time of such closing or the date and time specified or the time of the event specified in such vote or written consent is referred to herein as the "**Mandatory Conversion Time**"), (i) all outstanding shares of Series Preferred shall automatically be

converted into shares of Common Stock, at the then effective conversion rate and (ii) such shares may not be reissued by the Corporation."

4. Thereafter, pursuant to a resolution of the Board, this Seventh Certificate of Amendment was submitted to the stockholders of the Corporation for their approval, and was duly adopted in accordance with Sections 228 and 242 of the DGCL.

5. All other provisions of the Charter, as amended to date and as currently on file with the Secretary of State of the State of Delaware, shall remain in full force and effect.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the Corporation has caused this Seventh Certificate of Amendment to be signed by its Chief Executive Officer this 15th day of August, 2018.

/s/ R. Erik Holmlin

Name: R. Erik Holmlin
Title: Chief Executive Officer

WARRANT AGREEMENT
BIONANO GENOMICS, INC.

AND

AMERICAN STOCK TRANSFER & TRUST COMPANY, LLC, AS WARRANT AGENT

THIS WARRANT AGREEMENT (this "***Agreement***"), dated as of [•], 2018, is by and between **BIONANO GENOMICS, INC.**, a Delaware corporation (the "***Company***"), and **AMERICAN STOCK TRANSFER & TRUST COMPANY, LLC**, a New York limited liability trust company, as Warrant Agent (the "***Warrant Agent***").

WHEREAS, the Company is engaged in an initial public offering (the "***Offering***") of units (the "***Units,***" and each a "***Unit***"), with each unit consisting of (i) one share of common stock, $0.0001 par value per share (the "***Common Stock***"), of the Company, and (ii) a warrant to purchase one share of Common Stock at a purchase price of $ [•] per share, subject to adjustment as described herein (each, a "***Warrant***");

WHEREAS, the Company has filed with the Securities and Exchange Commission (the "***Commission***") a registration statement, as amended, on Form S-1, No. 333-225970 (the "***Registration Statement***") and prospectus (the "***Prospectus***"), for the registration, under the Securities Act of 1933, as amended (the "***Securities Act***"), of the offer and sale of the Units, the Common Stock underlying the Units, the Warrants and the Common Stock issuable upon exercise of the Warrants;

WHEREAS, the Company desires the Warrant Agent to act on behalf of the Company, and the Warrant Agent is willing to so act, in connection with the issuance, registration, transfer, exchange and exercise of the Warrants;

WHEREAS, the Company desires to provide for the form and provisions of the Warrants, the terms upon which they shall be issued and exercised, and the respective rights, limitation of rights, and immunities of the Company, the Warrant Agent, and the holders of the Warrants (each a "***Holder***"); and

WHEREAS, all acts and things have been done and performed which are necessary to make the Warrants, when executed on behalf of the Company and countersigned by or on behalf of the Warrant Agent, as provided herein, the valid, binding and legal obligations of the Company, and to authorize the execution and delivery of this Agreement.

NOW, THEREFORE, in consideration of the mutual agreements herein contained, the parties hereto agree as follows:

1. **APPOINTMENT OF WARRANT AGENT**. The Company hereby appoints the Warrant Agent to act as agent for the Company for the Warrants, and the Warrant Agent hereby accepts such appointment and agrees to perform the same in accordance with the terms and conditions set forth in this Agreement.

2. **WARRANTS**.

2.1 Form of Warrants. Each Warrant shall be issued in registered form only and shall be in substantially the form attached hereto as Exhibit A, the provisions of which are incorporated herein. Each Warrant shall be signed by, or bear the facsimile signature of, the President, Chief Executive Officer or Chief Financial Officer of the Company. In the event the person whose facsimile signature has been placed upon any Warrant shall have ceased to serve in the capacity in which such person signed the Warrant before such Warrant is issued, it may be issued with the same effect as if he or she had not ceased to be such at the date of issuance.

2.2 Effect of Countersignature. Unless and until countersigned by the Warrant Agent pursuant to this Agreement, a Warrant shall be invalid and of no effect and may not be exercised by the Holder thereof.

2.3 Registration.

2.3.1 Warrant Register. The Warrant Agent shall maintain books (the "***Warrant Register***"), for the registration of original issuance and the registration of transfer of the Warrants. Upon the initial issuance of the Warrants, the Warrant Agent shall issue and register the Warrants in the names of the respective Holders thereof in such denominations and otherwise in accordance with instructions delivered to the Warrant Agent by the Company.

2.3.2 Registered Holder. Prior to due presentment for registration of transfer of any Warrant, the Company and the Warrant Agent may deem and treat the person in whose name such Warrant is registered in the Warrant Register (the "***Registered Holder***") as the absolute owner of such Warrant and of each Warrant represented thereby (notwithstanding any notation of ownership or other writing on the Warrant Certificate (as defined below) made by anyone other than the Company or the Warrant Agent), for the purpose of any exercise thereof, and for all other purposes, and neither the Company nor the Warrant Agent shall be affected by any notice to the contrary.

3. TERMS AND EXERCISE OF WARRANTS.

3.1 Detachability of Warrants. Each of the Common Stock and the Warrants comprising the Units will begin to trade separately on (i) the first trading day following the 30th day after the date of effectiveness of the Registration Statement, or (ii) such earlier date as Roth Capital Partners, LLC, as representative of the underwriters in the Offering, shall determine is acceptable based upon, among other things, its assessment of the relative strengths of the securities markets and small capitalization companies in general, and the trading pattern of, and demand for, the Company's securities in particular (such date as applicable, the "***Detachment Date***"). In no event will separate trading of the securities comprising the Units commence earlier than the date referenced in sub-clause (i) in the first sentence of this paragraph unless the Company first issues a press release announcing when such separate trading will begin.

3.2 Warrants Exercise Price. Each Warrant shall, when countersigned by the Warrant Agent, entitle the Registered Holder thereof, subject to the provisions of such Warrant and of this Agreement, to purchase from the Company the number of shares of Common Stock of the Company stated therein, at the price of $[•] per share, subject to the adjustments provided herein; *provided, however*, that only whole Warrants may be exercised. The term "***Exercise Price***" as used in this Agreement shall mean the price per share at which the shares of Common Stock may be purchased at the time a whole Warrant is exercised.

3.3 Duration of Warrants. Each Warrant may be exercised, in whole or in part, at any time during the period commencing on the Detachment Date and ending at 5:00pm New York City time on the date that is five years following the date of effectiveness of the Registration Statement (the "***Expiration Date***"). For purposes of this Agreement, the term "***Exercise Period***" means the period during which the Warrants are exercisable, as described in this subsection 3.3. Each Warrant not exercised on or before the Expiration Date shall become void, and all rights thereunder and all rights in respect thereof under this Warrant Agreement shall cease at the close of business on the Expiration Date. The Company may extend the duration of the Warrants by delaying the Expiration Date; *provided, however*, that the Company will provide notice of not less than 20 days to Registered Holders of such extension and that such extension shall be identical in duration among all of the then outstanding Warrants. The exercise of any Warrant shall be subject to the satisfaction of any applicable conditions, as set forth in subsection 3.4 below. Any Warrant not exercised on or before the applicable Expiration Date shall become void, and all rights thereunder and

all rights in respect thereof under this Agreement shall cease at 5:00 p.m. New York City time on such Expiration Date.

3.4 Exercise of Warrants.

3.4.1 Payment. Subject to the provisions of the Warrant and this Agreement, a Warrant, when countersigned by the Warrant Agent, may be exercised by the Registered Holder thereof by submitting a duly executed election to purchase attached to the applicable Warrant, at the office of the Warrant Agent in the Borough of Brooklyn, City and State of New York or at the office of its successor as Warrant Agent, in the Borough of Brooklyn, City and State of New York, which may be done by paying, within two (2) days of the date of exercise, in full the Exercise Price for each whole share of Common Stock as to which the Warrant is exercised, in lawful money of the United States of America, by wire transfer or in good certified check or good bank draft payable to the order of the Company or by Cashless Exercise solely in accordance with Section 3.4.2 hereof. The Registered Holder shall not be required to deliver the original Warrant being exercised in order to effect an exercise hereunder. Upon delivery of an exercise notice, the Holder shall be deemed for all corporate purposes to have become the holder of record of the Common Stock with respect to which such Warrant has been exercised, irrespective of the date such shares of Common Stock are credited to the Holder's DTC account or the date of delivery of the certificates evidencing such shares of Common Stock (as the case may be).

***Checks should be payable to American Stock Transfer & Trust Company, LLC. Originals need to be mailed to American Stock Transfer, Attention: [•]. Wired funds for exercise should be wired to:

JP MORGAN CHASE BANK
ABA # [•]
ACCT # [•]
ACCT NAME: AMERICAN STOCK TRANSFER & TRUST CO
AS AGENT FOR WARRANTS
ATTN: [•]

3.4.2 Cashless Exercise. Notwithstanding anything contained herein to the contrary, if and only if an effective registration statement covering the offer and sale of the shares of Common Stock that are subject to the exercise notice is not available for the issuance of such shares of Common Stock, the Registered Holder may exercise, by submitting a duly executed election to Cashless Exercise (as defined below) to the Company pursuant to Section 8.2 herein, a Warrant in whole or in part and, in lieu of making the cash payment otherwise contemplated to be made to the Company upon such exercise in payment of the aggregate Exercise Price, elect instead to receive upon such exercise the "Net Number" of shares of Common Stock determined according to the following formula (a "***Cashless Exercise***"):

$$\text{Net Number} = \frac{(A \times B) - (A \times C)}{B}$$

For purposes of the foregoing formula:

A = the total number of shares with respect to which the Warrant is then being exercised.

B = the arithmetic average of the Closing Sale Prices (as defined below) of the Common Stock for the five (5) consecutive Trading Days ending on the date immediately preceding the date of the Exercise Notice.

C = the Exercise Price then in effect for the applicable shares of Common Stock at the time of such exercise.

The term "***Closing Sale Price***" means, for any security as of any date, the last closing bid price and last closing trade price, respectively, for such security on the Nasdaq Stock Market LLC, as reported by

Bloomberg, L.P. ("***Bloomberg***"), or, if the Nasdaq Stock Market LLC begins to operate on an extended hours basis and does not designate the closing bid price or the closing trade price, as the case may be, then the last bid price or the last trade price, respectively, of such security prior to 4:00:00 p.m., New York time, as reported by Bloomberg, or, if the Nasdaq Stock Market LLC is not the principal securities exchange or trading market for such security, the last closing bid price or last trade price, respectively, of such security on the principal securities exchange or trading market where such security is listed or traded as reported by Bloomberg, or if the foregoing do not apply, the last closing bid price or last trade price, respectively, of such security in the over-the-counter market on the electronic bulletin board for such security as reported by Bloomberg, or, if no closing bid price or last trade price, respectively, is reported for such security by Bloomberg, the average of the bid prices, or the ask prices, respectively, of any market makers for such security as reported in the OTC Link or "***pink sheets***" by OTC Markets Group Inc. (formerly Pink OTC Markets Inc.). If the Closing Sale Price cannot be calculated for a security on a particular date on any of the foregoing bases, the Closing Sale Price of such security on such date shall be the fair market value as mutually determined by the Company and the Registered Holder. If the Company and the Registered Holder are unable to agree upon the fair market value of such security, then such dispute shall be resolved pursuant to Section 8.4 hereof. All such determinations to be appropriately adjusted for any stock dividend, stock split, stock combination or other similar transaction during the applicable calculation period.

For purposes of Rule 144(d) promulgated under the Securities Act, as in effect on the date hereof, assuming the Registered Holder is not an affiliate of the Company, the shares of Common Stock issued in a Cashless Exercise shall be deemed to have been acquired by the Registered Holder, and the holding period for the Common Stock shall be deemed to have commenced, on the date the Warrant was originally issued.

3.4.3 Issuance of Common Stock on Exercise. Assuming funds for exercise are paid on or before the second trading day following the date of receipt by the Company of an exercise notice, then on or before the third trading day following the date upon which the Company has received an exercise notice for a Warrant, the Company shall cause its transfer agent to (i) *provided* that the transfer agent is participating in The Depository Trust Company ("***DTC***") Fast Automated Securities Transfer Program, credit such aggregate number of shares of Common Stock to which the Holder is entitled pursuant to such exercise to the Holder's or its designee's balance account with DTC through its Deposit/Withdrawal at Custodian System, or (ii) if the transfer agent is not participating in the DTC Fast Automated Securities Transfer Program, issue and deliver to the Holder, or at the Holder's instruction pursuant to the delivered exercise notice, the Holder's agent or designee, in each case pursuant to this clause (ii), sent by reputable overnight courier to the address specified in the applicable exercise notice, a certificate, registered in the Company's share register in the name of the Holder or its designee (as indicated in the applicable exercise notice), for the number of shares of Common Stock to which the Holder is entitled pursuant to such exercise.

3.4.4 Valid Issuance. All shares of Common Stock issued or issuable upon the proper exercise of a Warrant in conformity with this Agreement shall be validly issued, fully paid and nonassessable.

3.4.5 Share Delivery Failure. If the Company shall fail, for any reason or for no reason, to issue to the Holder within three (3) trading days after receipt of the applicable exercise notice (the "***Share Delivery Deadline***"), a certificate for the number of shares of Common Stock to which the Holder is entitled upon Holder's exercise of a Warrant, or credit the Holder's balance account with DTC for such number of shares of Common Stock to which the Holder is entitled upon the Holder's exercise of a Warrant (as the case may be, but in each case without a restrictive legend) (a "***Delivery Failure***"), then the Holder will have the right to rescind such exercise by giving written notice to the Company.

3.5 Beneficial Ownership Limitation on Exercises. The Company shall not affect the exercise of any portion of a Warrant, and the Registered Holder of such Warrant shall not have the right to exercise any portion of such Warrant, to the extent that after giving effect to such exercise, the Registered Holder (together with the Registered Holder's affiliates, and any persons acting as a group together with the Holder or any Registered Holder's affiliates) would beneficially own in excess of [4.99%] [OR] [9.99%] (the "***Maximum Percentage***") of the shares of Common Stock outstanding immediately after giving effect to such exercise, *provided*, *however*, that the foregoing limitation on exercise shall not apply to any

Registered Holder who, together with such Registered Holder's affiliates, and any persons acting as a group together with such Registered Holder and such Registered Holder's affiliates, owns in excess of the Maximum Percentage immediately prior to the closing of the Offering. For purposes of the foregoing sentence, the aggregate number of shares of Common Stock beneficially owned by such Registered Holder and its affiliates shall include the number of shares of Common Stock issuable upon exercise of a Warrant with respect to which the determination of such sentence is being made, but shall exclude Common Stock which would be issuable upon (i) exercise of the remaining, unexercised portion of such Warrant beneficially owned by the Registered Holder and its affiliates and (ii) exercise or conversion of the unexercised or unconverted portion of any other securities of the Company beneficially owned by the Registered Holder and its affiliates (including, without limitation, any convertible notes or convertible preferred stock or warrants) subject to a limitation on conversion or exercise analogous to the limitation contained herein beneficially owned by the Registered Holder or any of its affiliates. Except as set forth in the preceding sentence, for purposes of this paragraph, beneficial ownership shall be calculated in accordance with Section 13(d) of the Securities Exchange Act of 1934, as amended (the "***Exchange Act***"). To the extent that the limitation contained in this Section 3.5 applies, the Registered Holder's submission of an Election to Purchase shall be deemed to be the Registered Holder's determination of whether a Warrant is exercisable (in relation to any other securities owned by the Registered Holder together with any affiliates) and of which portion of a Warrant is exercisable, in each case subject to the Maximum Percentage, and the Company shall have no obligation to verify or confirm the accuracy of such determination. In addition, a determination as to any group status as contemplated above shall be determined in accordance with Section 13(d) of the Exchange Act and the rules and regulations promulgated thereunder. For purposes of the Warrants, in determining the number of outstanding shares of Common Stock, the Registered Holder may rely on the number of outstanding shares of Common Stock as reflected in the most recent of (A) the Company's most recent Form 10-K, Form 10-Q, Form 8-K or other public filing with the Commission, as the case may be, (B) a more recent public announcement by the Company or (C) any other notice by the Company or its transfer agent setting forth the number of shares of Common Stock outstanding. For any reason at any time, upon the written or oral request of the Registered Holder, the Company shall within three (3) trading days confirm to the Registered Holder the number of shares of Common Stock then outstanding. In any case, the number of outstanding shares of Common Stock shall be determined after giving effect to the conversion or exercise of securities of the Company, including any Warrant, by the Registered Holder and its affiliates since the date as of which such number of outstanding shares of Common Stock was reported. By written notice to the Company, the Registered Holder may from time to time increase or decrease the Maximum Percentage to any other percentage of the number of shares of Common Stock outstanding immediately after giving effect to the issuance of shares of Common Stock upon exercise of a Warrant and the provisions of this Section 3.5 shall continue to apply; *provided* that (i) any such increase will not be effective until the sixty-first (61st) day after such notice is delivered to the Company, and (ii) any such increase or decrease will apply only to that Registered Holder. For purposes of clarity, the Common Stock underlying any Warrant in excess of the Maximum Percentage for a Registered Holder shall not be deemed to be beneficially owned by that Registered Holder for any purpose including for purposes of Section 13(d) or Rule 16a-1(a)(1) of the Exchange Act. The provisions of this paragraph shall be construed and implemented in a manner otherwise than in strict conformity with the terms of this Section 3.5 to the extent necessary to correct this paragraph (or any portion hereof) which may be defective or inconsistent with the intended beneficial ownership limitation herein contained or to make changes or supplements necessary or desirable to properly give effect to such limitation.

4. ADJUSTMENTS.

4.1 Stock Dividends.

4.1.1 Share Dividends and Splits. If after the date hereof, and subject to the provisions of Section 4.5 below, the number of outstanding shares of Common Stock is increased by a stock dividend payable in shares of Common Stock, or by a stock split of the Common Stock or other similar event, then, on the effective date of such stock dividend, stock split or similar event (which, for the avoidance of doubt, shall not include any shares of Common Stock issued by the Company upon exercise of the Warrants), the number of shares of Common Stock issuable on exercise of each Warrant shall be increased in proportion to such increase in the outstanding shares of Common Stock and the Exercise Price shall be proportionally

decreased such that the aggregate Exercise Price, after such adjustments, remains the same for each Warrant.

4.1.2 Other Distributions. If the Company shall declare any distribution (which, for the avoidance of doubt, shall not include any shares of Common Stock issued by the Company upon exercise of the Warrants) of its assets (or rights to acquire its assets) to holders of shares of Common Stock, by way of return of capital or otherwise (including, without limitation, any distribution of cash, stock or other securities, property or options by way of a dividend, spin off, reclassification, corporate rearrangement, scheme of arrangement or other similar transaction), except to the extent an adjustment was already made pursuant to Section 4.1.1 or 4.2 (a "***Distribution***"), at any time after the issuance of a Warrant, then, in each such case, the Company shall reserve and put aside the maximum Distribution amount the Holder would have been entitled to receive if the Holder had held the number of shares of Common Stock acquirable upon complete exercise of such Warrant (without regard to any limitations on exercise thereof, including without limitation, the Maximum Percentage) immediately before the date on which a record is taken for such Distribution, or, if no such record is taken, the date as of which the record holders of Common Stock are to be determined for the participation in such Distribution. Upon exercise of a Warrant, in whole or in part, the Company shall, contemporaneously with the delivery of the Common Stock, distribute to the Holder a pro rata portion of such Distribution based on the portion of the Warrant that has been exercised (*provided*, *however*, to the extent that the Holder's right to participate in any such Distributions would result in the Holder exceeding the Maximum Percentage, then the Holder shall not be entitled to participate in such Distribution at such time and to such extent (or the beneficial ownership of any such shares of Common Stock as a result of such Distribution to such extent) and such Distribution to such extent shall be held in abeyance for the benefit of the Holder until such time, if ever, as its right thereto would not result in the Holder exceeding the Maximum Percentage, at which time or times the Holder shall be granted such Distribution (and any Distributions declared or made on such initial Distribution or on any subsequent Distribution to be held similarly in abeyance) to the same extent as if there had been no such limitation).

4.2 Aggregation of Shares. If after the date hereof, and subject to the provisions of Section 4.5 hereof, the number of outstanding shares of Common Stock is decreased by a consolidation, combination, reverse stock split or reclassification of the Common Stock or other similar event, then, on the effective date of such consolidation, combination, reverse stock split, reclassification or similar event, the number of shares of Common Stock issuable on exercise of each Warrant shall be decreased in proportion to such decrease in outstanding shares of Common Stock and the Exercise Price shall be proportionally increased such that the aggregate Exercise Price, after such adjustments, remains the same for each Warrant.

4.3 Purchase Rights. If at any time the Company grants, issues or sells any options, convertible securities or rights to purchase stock, warrants, securities or other property pro rata to the record holders of Common Stock (the "***Purchase Rights***"), then the Holder will be entitled to acquire, upon the terms applicable to such Purchase Rights, the aggregate Purchase Rights which the Holder could have acquired if the Holder had held the number of shares of Common Stock acquirable upon complete exercise of a Warrant (without regard to any limitations on exercise hereof, including without limitation, the Maximum Percentage) immediately before the date on which a record is taken for the grant, issuance or sale of such Purchase Rights, or, if no such record is taken, the date as of which the record holders of shares of Common Stock are to be determined for the grant, issue or sale of such Purchase Rights (*provided*, *however*, to the extent that the Holder's right to participate in any such Purchase Right would result in the Holder exceeding the Maximum Percentage, then the Holder shall not be entitled to participate in such Purchase Right to such extent (or beneficial ownership of such shares of Common Stock as a result of such Purchase Right to such extent) and such Purchase Right to such extent shall be held in abeyance for the Holder until such time, if ever, as its right thereto would not result in the Holder exceeding the Maximum Percentage, at which time or times the Holder shall be granted such right (and any Purchase Right granted, issued or sold on such initial Purchase Right or on any subsequent Purchase Right to be held similarly in abeyance) to the same extent as if there had been no such limitation).

4.4 Fundamental Transactions. If, at any time while the Warrants are outstanding, (i) the Company, directly or indirectly, in one or more related transactions effects any merger or consolidation of

the Company with or into another person, (ii) the Company, directly or indirectly, effects any sale, lease, license, assignment, transfer, conveyance or other disposition of all or substantially all of its assets in one or a series of related transactions, (iii) any, direct or indirect, purchase offer, tender offer or exchange offer (whether by the Company or another person) is completed pursuant to which holders of Common Stock are permitted to sell, tender or exchange their shares for other securities, cash or property and has been accepted by the holders of 50% or more of the outstanding shares of Common Stock, (iv) the Company, directly or indirectly, in one or more related transactions effects any reclassification, reorganization or recapitalization of the Common Stock or any compulsory share exchange pursuant to which the Common Stock is effectively converted into or exchanged for other securities, cash or property, or (v) the Company, directly or indirectly, in one or more related transactions consummates a stock or share purchase agreement or other business combination (including, without limitation, a reorganization, recapitalization, spin-off or scheme of arrangement) with another person or group of persons whereby such other person or group acquires more than 50% of the outstanding shares of Common Stock (not including any shares of Common Stock held by the other person or other persons making or party to, or associated or affiliated with the other persons making or party to, such stock or share purchase agreement or other business combination) (each, a "***Fundamental Transaction***"), then, upon any subsequent exercise of a Warrant, the Registered Holder of such Warrant shall be entitled to receive, for each share of Common Stock that would have been issuable upon such exercise immediately prior to the occurrence of such Fundamental Transaction (without regard to any limitation in Section 3.5 on the exercise of the Warrants), the number of shares of Common Stock of the successor or acquiring corporation or of the Company, if it is the surviving corporation, and any additional consideration (the "***Alternate Consideration***") which, in all cases, was received as a result of such Fundamental Transaction by a holder of the number of shares of Common Stock for which a Warrant is exercisable immediately prior to such Fundamental Transaction (without regard to any limitation in Section 3.5 on the exercise of the Warrants). If holders of Common Stock are given any choice as to the securities, cash or property to be received in a Fundamental Transaction, then each Registered Holder shall be given the same choice. Notwithstanding anything to the contrary, (a) if the holders of Common Stock received, as a result of such Fundamental Transaction, a consideration or Alternate Consideration (whether from the Company or from any other person, and whether such consideration or Alternate Consideration is comprised of cash, securities or other property) (such consideration attributed to one share of Common Stock: the "***Fundamental Transaction Consideration Per Share of Common Stock***") with respect to some but not all of their shares of Common Stock (including in the event that they have tendered only some of the shares of Common Stock which such shareholders have initially requested to tender) then, upon any subsequent exercise of a Warrant, the Registered Holder of such Warrant shall be entitled to receive such consideration on a pro-rata basis, based on the number of shares of Common Stock underlying its Warrant; and (b) in the event that the Fundamental Transaction Consideration Per Share of Common Stock paid as a result of such Fundamental Transaction is paid by the Successor Entity (as defined below) or by any other person other than the Company, then such Successor Entity or the other person shall assume and be responsible to pay the Fundamental Transaction Consideration Per Share of Common Stock upon any subsequent exercise of a Warrant. The Company shall cause any successor entity in a Fundamental Transaction in which the Company is not the survivor (the "***Successor Entity***") to assume in writing all obligations of the Company under each Warrant in accordance with the provisions of this Section 4.4 pursuant to agreements in form and substance reasonably satisfactory to the Registered Holders and approved by the Registered Holder (without unreasonable delay) prior to such Fundamental Transaction and shall, at the option of each Registered Holder, deliver to such Registered Holder in exchange for such Registered Holder's Warrant a written instrument substantially similar in form and substance to such Registered Holder's Warrant which is exercisable for a corresponding number of shares of capital stock of such Successor Entity (or its parent entity) equivalent to the shares of Common Stock acquirable and receivable upon exercise of such Warrant (without regard to the limitations on exercise set forth in Section 3.5) prior to such Fundamental Transaction, and with an exercise price which applies the Exercise Price hereunder to such shares of capital stock (but taking into account the relative value of the Common Stock pursuant to such Fundamental Transaction and the value of such shares of capital stock, such number of shares of capital stock and such exercise price being for the purpose of protecting the economic value of such Warrant immediately prior to the consummation of such Fundamental Transaction). Upon the occurrence of any such Fundamental Transaction, the Successor Entity shall succeed to, and be substituted for (so that from and after the date of such Fundamental Transaction, the provisions of this Agreement and each Warrant referring to the

"***Company***" shall refer instead to the Successor Entity), and may exercise every right and power of the Company and shall assume all of the obligations of the Company under this Agreement and each Warrant with the same effect as if such Successor Entity had been named as the Company herein.

4.5 Calculations. All calculations under this Section 4 shall be made to the nearest cent or the nearest whole share, as the case may be. For purposes of this Section 4, any calculation of the number of shares of Common Stock deemed to be issued and outstanding as of a given date shall not include treasury shares, if any. Notwithstanding anything to the contrary in this Section 4, no adjustment in the Exercise Price shall be required unless such adjustment would require an increase or decrease of at least 1% in such price; *provided*, *however*, that any adjustments which by reason of the immediately preceding sentence are not required to be made shall be carried forward and taken into account in any subsequent adjustment. In any case in which this Section 4 shall require that an adjustment in the Exercise Price be made effective as of a record date for a specified event, if the Registered Holder exercises a Warrant after such record date, the Company may elect to defer, until the occurrence of such event, the issuance of Common Stock and other capital stock of the Company in excess of the Common Stock and other capital stock of the Company, if any, issuable upon such exercise on the basis of the Exercise Price in effect prior to such adjustment; *provided*, *however*, that in such case the Company or the Warrant Agent shall deliver to the Registered Holder a due bill or other appropriate instrument evidencing the Registered Holder's right to receive such additional shares and/or other capital securities upon the occurrence of the event requiring such adjustment.

4.6 Notices of Changes in Warrant. Upon every adjustment of the Exercise Price or the number of shares issuable upon exercise of a Warrant, the Company shall give written notice thereof to the Warrant Agent, which notice shall state the Exercise Price resulting from such adjustment and the increase or decrease, if any, in the number of shares purchasable at such price upon the exercise of a Warrant, setting forth in reasonable detail the method of calculation and the facts upon which such calculation is based. Upon occurrence of any event specified in Sections 4.1, 4.2, 4.3 or 4.4, the Company shall give written notice of the occurrence of such event to each Warrant holder, at the last address set forth for such holder in the Warrant Register, of the record date or the effective date of the event. Failure to give such notice, or any defect therein, shall not affect the legality or validity of such event.

4.7 No Fractional Shares. Notwithstanding any provision contained in this Agreement to the contrary, the Company shall not issue fractional shares upon exercise of Warrants. If, by reason of any adjustment made pursuant to this Section 4, the holder of any whole Warrant would be entitled, upon the exercise of such Warrant, to receive a fractional interest in a share, the Company shall, upon such exercise, round to the nearest whole number, the number of shares of Common Stock to be issued to such holder.

4.8 Form of Warrant. The form of Warrant need not be changed because of any adjustment pursuant to this Section 4, and Warrants issued after such adjustment may state the same Exercise Price and the same number of shares as is stated in the Warrants initially issued pursuant to this Agreement.

4.9 Other Events. In case any event shall occur affecting the Company as to which none of the provisions of preceding subsections of this Section 4 are strictly applicable, but which would require an adjustment to the terms of the Warrants in order to (i) avoid an adverse impact on the Warrants and (ii) effectuate the intent and purpose of this Section 4, then, in each such case, the Company shall appoint a firm of independent public accountants, investment banking or other appraisal firm of recognized national standing, which shall give its opinion as to whether or not any adjustment to the rights represented by the Warrants is necessary to effectuate the intent and purpose of this Section 4 and, if they determine that an adjustment is necessary, the terms of such adjustment. The Company shall adjust the terms of the Warrants in a manner that is consistent with any adjustment recommended in such opinion.

5. TRANSFER AND EXCHANGE OF WARRANTS.

5.1 Registration of Transfer. The Warrant Agent shall register the transfer, from time to time, of any outstanding Warrant upon the Warrant Register, upon surrender of such Warrant for transfer, properly endorsed with signatures properly guaranteed and accompanied by appropriate instructions for

transfer. Upon any such transfer, a new Warrant representing an equal aggregate number of Warrants shall be issued and the old Warrant shall be cancelled by the Warrant Agent. The Warrants so cancelled shall be delivered by the Warrant Agent to the Company from time to time upon request.

5.2 Procedure for Surrender of Warrants. Warrants may be surrendered to the Warrant Agent, together with a written request for exchange or transfer, and thereupon the Warrant Agent shall issue in exchange therefor one or more new Warrants as requested by the Registered Holder of the Warrants so surrendered, representing an equal aggregate number of Warrants.

5.3 Warrant Execution and Countersignature. The Warrant Agent is hereby authorized to countersign and to deliver, in accordance with the terms of this Agreement, the Warrants required to be issued pursuant to the provisions of this Section 5.

6. OTHER PROVISIONS RELATING TO RIGHTS OF HOLDERS OF WARRANTS.

6.1 No Rights as Stockholder. A Warrant does not entitle the Registered Holder thereof to any of the rights of a stockholder of the Company, including, without limitation, except as otherwise set forth herein or in any Warrant, the right to receive dividends, or other distributions, exercise any preemptive rights to vote or to consent or to receive notice as stockholders in respect of the meetings of stockholders or the election of directors of the Company or any other matter.

6.2 Lost, Stolen, Mutilated, or Destroyed Warrants. If any Warrant is lost, stolen, mutilated, or destroyed, the Company and the Warrant Agent may on such terms as to indemnity bond or otherwise as they may in their discretion impose (which shall, in the case of a mutilated Warrant, include the surrender thereof), issue a new Warrant of like denomination, tenor, and date as the Warrant so lost, stolen, mutilated, or destroyed. Any such new Warrant shall constitute a substitute contractual obligation of the Company, whether or not the allegedly lost, stolen, mutilated, or destroyed Warrant shall be at any time enforceable by anyone.

6.3 Reservation of Common Stock. The Company shall at all times reserve and keep available a number of its authorized but unissued shares of Common Stock that shall be sufficient to permit the exercise in full of all outstanding Warrants issued pursuant to this Agreement.

6.4 Registration of Common Stock. The Company registered the Warrants and the Common Stock underlying the Warrants in the Registration Statement. The Company will use its reasonable best efforts to maintain the effectiveness of such Registration Statement and the current status of the Prospectus or to file and maintain the effectiveness of another registration statement and another current prospectus covering the Common Stock issuable upon exercise of the Warrants at any time that the Warrants are exercisable. In addition, the Company agrees to use its reasonable best efforts to register such shares of Common Stock under the blue sky laws of the states of residence of the exercising Warrant holders to the extent an exemption from such registration is not available.

7. CONCERNING THE WARRANT AGENT AND OTHER MATTERS.

7.1 Payment of Taxes. The Company shall from time to time promptly pay all taxes and charges that may be imposed upon the Company or the Warrant Agent in respect of the issuance or delivery of the Common Stock upon the exercise of the Warrants, but the Company shall not be obligated to pay any transfer taxes in respect of the Warrants or such shares. Except as otherwise required by law, the Company shall not be obligated to honor the exercise of any Warrant by or on behalf of a Registered Holder until all tax consequences (if any) arising from the exercise of such Warrant are resolved in a manner reasonably acceptable to the Company.

7.2 Resignation, Consolidation, or Merger of Warrant Agent.

7.2.1 Appointment of Successor Warrant Agent. The Warrant Agent, or any successor hereafter appointed, may resign its duties and be discharged from all further duties and liabilities hereunder after giving sixty (60) days' notice in writing to the Company. If the office of the Warrant Agent becomes vacant by resignation or incapacity to act or otherwise, the Company shall appoint in writing a successor Warrant Agent in place of the Warrant Agent. If the Company shall fail to make such appointment within a period of thirty (30) days after it has been notified in writing of such resignation or incapacity by the Warrant Agent or by the holder of a Warrant (who shall, with such notice, submit his Warrant for inspection by the Company), then the holder of any Warrant may apply to the Supreme Court of the State of New York for the County of New York for the appointment of a successor Warrant Agent at the Company's cost. Any successor Warrant Agent, whether appointed by the Company or by such court, shall be a corporation in good standing in the State of New York and having its principal office in the Borough of Brooklyn, City and State of New York, and authorized under such laws to exercise corporate trust powers and subject to supervision or examination by federal or state authority. After appointment, any successor Warrant Agent shall be vested with all the authority, powers, rights, immunities, duties, and obligations of its predecessor Warrant Agent with like effect as if originally named as Warrant Agent hereunder, without any further act or deed; but if for any reason it becomes necessary or appropriate, the predecessor Warrant Agent shall execute and deliver, at the expense of the Company, an instrument transferring to such successor Warrant Agent all the authority, powers, and rights of such predecessor Warrant Agent hereunder; and upon request of any successor Warrant Agent the Company shall make, execute, acknowledge, and deliver any and all instruments in writing for more fully and effectually vesting in and confirming to such successor Warrant Agent all such authority, powers, rights, immunities, duties, and obligations.

7.2.2 Notice of Successor Warrant Agent. In the event a successor Warrant Agent shall be appointed, the Company shall give notice thereof to the predecessor Warrant Agent and the transfer agent for the Common Stock not later than the effective date of any such appointment.

7.2.3 Merger or Consolidation of Warrant Agent. Any company into which the Warrant Agent may be merged or with which it may be consolidated or any corporation resulting from any merger or consolidation to which the Warrant Agent shall be a party shall be the successor Warrant Agent under this Agreement without any further act.

7.3 Fees and Expenses of Warrant Agent.

7.3.1 Remuneration. The Company agrees to pay the Warrant Agent reasonable remuneration for its services as such Warrant Agent hereunder and any transfer agent fees which are in addition thereto and shall, pursuant to its obligations under this Agreement, reimburse the Warrant Agent upon demand for all expenditures that the Warrant Agent may reasonably incur in the execution of its duties hereunder.

7.3.2 Further Assurances. The Company agrees to perform, execute, acknowledge, and deliver or cause to be performed, executed, acknowledged, and delivered all such further and other acts, instruments, and assurances as may reasonably be required by the Warrant Agent for the carrying out or performing of the provisions of this Agreement.

7.4 Liability of Warrant Agent.

7.4.1 Reliance on Company Statement. Whenever in the performance of its duties under this Agreement, the Warrant Agent shall deem it necessary or desirable that any fact or matter be proved or established by the Company prior to taking or suffering any action hereunder, such fact or matter (unless other evidence in respect thereof be herein specifically prescribed) may be deemed to be conclusively proved and established by a statement signed by the President, Chief Executive Officer or Chief Financial Officer of the Company and delivered to the Warrant Agent. The Warrant Agent may rely upon such statement for any action taken or suffered in good faith by it pursuant to the provisions of this Agreement.

7.4.2 Indemnity. The Warrant Agent shall be liable hereunder only for its own gross negligence, willful misconduct or bad faith. The Company agrees to indemnify the Warrant Agent and save it harmless against any and all liabilities, including judgments, costs and reasonable counsel fees, for anything done or omitted by the Warrant Agent in the execution of this Agreement, except as a result of the Warrant Agent's gross negligence, willful misconduct or bad faith.

7.4.3 Exclusions. The Warrant Agent shall have no responsibility with respect to the validity of this Agreement or with respect to the validity or execution of any Warrant (except its countersignature thereof). The Warrant Agent shall not be responsible for any breach by the Company of any covenant or condition contained in this Agreement or in any Warrant. The Warrant Agent shall not be responsible to make any adjustments required under the provisions of Section 4 hereof or responsible for the manner, method, or amount of any such adjustment or the ascertaining of the existence of facts that would require any such adjustment; nor shall it by any act hereunder be deemed to make any representation or warranty as to the authorization or reservation of any shares of Common Stock to be issued pursuant to this Agreement or any Warrant or as to whether any shares of Common Stock shall, when issued, be valid and fully paid and nonassessable.

7.5 Acceptance of Agency. The Warrant Agent hereby accepts the agency established by this Agreement and agrees to perform the same upon the terms and conditions herein set forth and among other things, shall account promptly to the Company with respect to Warrants exercised and concurrently account for, and pay to the Company, all monies received by the Warrant Agent for the purchase of Common Stock through the exercise of the Warrants.

8. MISCELLANEOUS PROVISIONS.

8.1 Successors. All the covenants and provisions of this Agreement by or for the benefit of the Company or the Warrant Agent shall bind and inure to the benefit of their respective successors and assigns.

8.2 Notices. Any notice, statement or demand authorized by this Agreement to be given or made by the Warrant Agent or by the holder of any Warrant to or on the Company shall be sufficiently given (i) when so delivered if by hand or overnight delivery, (ii) when sent, if delivered by facsimile (provided confirmation of transmission is mechanically or electronically generated and kept on file by the sending party) or by electronic mail, or (iii) if sent by certified mail or private courier service within five (5) days after deposit of such notice, postage prepaid, addressed (until another address is filed in writing by the Company with the Warrant Agent), as follows:

Bionano Genomics, Inc.
9640 Towne Centre Drive, Suite 100
San Diego, CA 92121
Attention: R. Erik Holmlin, Ph.D.

By Telefax (which constitutes notice): [ ]
By Email (which constitutes notice): eholmlin@bionanogenomics.com

with copies to (which shall not constitute notice):

Cooley LLP
4401 Eastgate Mall
San Diego, CA 92121
Attention: James Pennington

Any notice, statement or demand authorized by this Agreement to be given or made by the holder of any Warrant or by the Company to the Warrant Agent shall be sufficiently given (i) upon receipt if by hand or overnight delivery, (ii) when sent, if delivered by facsimile (provided confirmation of transmission is mechanically or electronically generated and kept on file by the sending party) or by electronic mail or (iii)

if sent by certified mail or private courier service within five (5) days after deposit of such notice, postage prepaid, addressed (until another address is filed in writing by the Warrant Agent with the Company), as follows:

American Stock Transfer & Trust Company, LLC
6201 15th Avenue, 3rd Floor
Brooklyn, New York 11219
Attention: Corporate Actions
By Email (which constitutes notice):[ ]@amstock.com

8.3 Additional Rights. Notwithstanding the foregoing or anything else herein to the contrary, other than as expressly provided in Section 3.4.5 hereof, if the Company is for any reason unable to issue and deliver the number of shares of Common Stock to which the Holder is entitled upon Holder's exercise of a Warrant, as required pursuant to the terms hereof, the Company shall have no obligation to pay to the Holder any cash or other consideration or otherwise net cash settle this Warrant.

8.4 Applicable Law. The validity, interpretation, and performance of this Agreement and of the Warrants shall be governed in all respects by the laws of the State of New York, without giving effect to conflicts of law principles that would result in the application of the substantive laws of another jurisdiction. The Company hereby agrees that any action, proceeding or claim against it arising out of or relating in any way to this Agreement shall be brought and enforced in the courts of the State of New York or the United States District Court for the Southern District of New York, and irrevocably submits to such jurisdiction, which jurisdiction shall be exclusive. The Company hereby waives any objection to such exclusive jurisdiction and that such courts represent an inconvenient forum.

8.5 Persons Having Rights under this Agreement. Nothing in this Agreement shall be construed to confer upon, or give to, any person or corporation other than the parties hereto and the Registered Holders of the Warrants any right, remedy, or claim under or by reason of this Agreement or of any covenant, condition, stipulation, promise, or agreement hereof. All covenants, conditions, stipulations, promises, and agreements contained in this Agreement shall be for the sole and exclusive benefit of the parties hereto and their successors and assigns and of the Registered Holders of the Warrants.

8.6 Examination of the Agreement. A copy of this Agreement shall be available at all reasonable times at the office of the Warrant Agent in the Borough of Brooklyn, City of New York and State of New York, for inspection by the Registered Holder of any Warrant. The Warrant Agent may require any such holder to submit his Warrant for inspection by it.

8.7 Counterparts. This Agreement may be executed in any number of original or facsimile counterparts and each of such counterparts shall for all purposes be deemed to be an original, and all such counterparts shall together constitute but one and the same instrument.

8.8 Effect of Headings. The section headings herein are for convenience only and are not part of this Agreement and shall not affect the interpretation thereof.

8.9 Amendments. This Agreement may be amended by the parties hereto without the consent of any Registered Holder for the purpose of curing any ambiguity, or curing, correcting or supplementing any defective provision contained herein or adding or changing any other provisions with respect to matters arising under this Agreement as the parties may deem necessary or desirable and that the parties deem shall not adversely affect the interest of the Registered Holders. All other modifications or amendments shall require the written consent of the Company and the Registered Holders holding Warrants to purchase at least a majority of the shares of Common Stock underlying the then outstanding Warrants. No consideration shall be offered by the Company to any Registered Holder in connection with a modification, amendment or waiver of this Agreement or any Warrant without also offering the same consideration to all Registered Holders.

8.10 Severability. This Agreement shall be deemed severable, and the invalidity or unenforceability of any term or provision hereof shall not affect the validity or enforceability of this Agreement or of any other term or provision hereof. Furthermore, in lieu of any such invalid or unenforceable term or provision, the parties hereto intend that there shall be added as a part of this Agreement a provision as similar in terms to such invalid or unenforceable provision as may be possible and be valid and enforceable.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed as of the date first above written.

COMPANY:

BIONANO GENOMICS, INC.

By: _____
Name: R. Erik Holmlin, Ph.D.
Title: President and Chief Executive Officer

WARRANT AGENT:

AMERICAN STOCK TRANSFER & TRUST COMPANY, LLC

By: _____
Name:
Title:

[SIGNATURE PAGE TO WARRANT AGREEMENT]

EXHIBIT A
[FORM OF WARRANT CERTIFICATE]

Number: _____ _____ Warrants

THIS WARRANT SHALL BE VOID IF NOT EXERCISED PRIOR TO THE EXPIRATION OF THE EXERCISE PERIOD PROVIDED FOR IN THE WARRANT AGREEMENT DESCRIBED BELOW

BIONANO GENOMICS, INC. CUSIP [•]

Warrant Certificate

This Warrant Certificate certifies that, or registered assigns, is the registered holder of warrant(s) (the "***Warrants***" and each, a "***Warrant***") to purchase shares of common stock, $0.0001 par value per share (the "***Common Stock***"), of Bionano Genomics, Inc., a Delaware corporation (the "***Company***"). Each Warrant entitles the holder, upon exercise during the period set forth in the Warrant Agreement referred to below, to receive from the Company that number of fully paid and nonassessable shares of Common Stock as set forth below, at the exercise price (the "***Exercise Price***") as determined pursuant to the Warrant Agreement, payable in lawful money (or through "***cashless exercise***" solely as provided for in the Warrant Agreement) of the United States of America upon surrender of this Warrant Certificate and payment of the Exercise Price at the office or agency of the Warrant Agent referred to below, subject to the conditions set forth herein and in the Warrant Agreement. Defined terms used in this Warrant Certificate but not defined herein shall have the meanings given to them in the Warrant Agreement (as defined on the reverse hereof).

Only whole Warrants may be exercised. Each whole Warrant is initially exercisable for one fully paid and non-assessable share of Common Stock. The number of shares of Common Stock issuable upon exercise of the Warrants is subject to adjustment upon the occurrence of certain events set forth in the Warrant Agreement.

The initial Exercise Price per share of Common Stock for any Warrant is equal to $ [•] per share. The Exercise Price is subject to adjustment upon the occurrence of certain events set forth in the Warrant Agreement.

Subject to the conditions set forth in the Warrant Agreement, the Warrants may be exercised only during the Exercise Period and to the extent not exercised by the end of such Exercise Period, such Warrants shall become void.

Reference is hereby made to the further provisions of this Warrant Certificate set forth on the reverse hereof and such further provisions shall for all purposes have the same effect as though fully set forth at this place.

This Warrant Certificate shall not be valid unless countersigned by the Warrant Agent, as such term is used in the Warrant Agreement.

This Warrant Certificate shall be governed by and construed in accordance with the internal laws of the State of New York, without regard to conflicts of laws principles thereof.

COMPANY:

BIONANO GENOMICS, INC.

By: _____
Name: R. Erik Holmlin, Ph.D.
Title: President and Chief Executive Officer

WARRANT AGENT:

AMERICAN STOCK TRANSFER & TRUST COMPANY, LLC

By: _____
Name:
Title:

[SIGNATURE PAGE TO WARRANT CERTIFICATE]

[FORM OF WARRANT CERTIFICATE]

[REVERSE]

The Warrants evidenced by this Warrant Certificate are part of a duly authorized issue of Warrants entitling the holder on exercise to receive shares of Common Stock and are issued or to be issued pursuant to a Warrant Agreement, dated as of [•], 2018 (the "***Warrant Agreement***"), duly executed and delivered by the Company to American Stock Transfer & Trust Company, LLC, as warrant agent (the "***Warrant Agent***"), which Warrant Agreement is hereby incorporated by reference in and made a part of this instrument and is hereby referred to for a description of the rights, limitation of rights, obligations, duties and immunities thereunder of the Warrant Agent, the Company and the holders (the words "***holders***" or "***holder***" meaning the Registered Holders or Registered Holder) of the Warrants. A copy of the Warrant Agreement may be obtained by the holder hereof upon written request to the Company. Defined terms used in this Warrant Certificate but not defined herein shall have the meanings given to them in the Warrant Agreement.

Warrants may be exercised at any time during the Exercise Period set forth in Section 3.3 of the Warrant Agreement.

Notwithstanding anything else in this Warrant Certificate or the Warrant Agreement, no Warrant may be exercised unless at the time of exercise (i) a registration statement covering offer and sale of the Common Stock to be issued upon exercise is effective under the Securities Act and (ii) a prospectus thereunder relating to the Common Stock is current, except through "***cashless exercise***" as provided for in the Warrant Agreement.

The Warrant Agreement provides that upon the occurrence of certain events the number of shares of Common Stock issuable upon exercise of the Warrants set forth on the face hereof may, subject to certain conditions, be adjusted. If, upon exercise of a whole Warrant, the holder thereof would be entitled to receive a fractional interest in a share of Common Stock, the Company shall, upon exercise, round to the nearest whole share of Common Stock to be issued to the holder of the Warrant.

Warrant Certificates, when surrendered at the principal corporate trust office of the Warrant Agent by the Registered Holder thereof in person or by legal representative or attorney duly authorized in writing, may be exchanged, in the manner and subject to the limitations provided in the Warrant Agreement, but without payment of any service charge, for another Warrant Certificate or Warrant Certificates of like tenor evidencing in the aggregate a like number of Warrants.

Upon due presentation for registration of transfer of this Warrant Certificate at the office of the Warrant Agent a new Warrant Certificate or Warrant Certificates of like tenor and evidencing in the aggregate a like number of Warrants shall be issued to the transferee(s) in exchange for this Warrant Certificate, subject to the limitations provided in the Warrant Agreement, without charge except for any tax or other governmental charge imposed in connection therewith.

The Company and the Warrant Agent may deem and treat the Registered Holder(s) hereof as the absolute owner(s) of this Warrant Certificate (notwithstanding any notation of ownership or other writing hereon made by anyone), for the purpose of any exercise hereof, of any distribution to the holder(s) hereof, and for all other purposes, and neither the Company nor the Warrant Agent shall be affected by any notice to the contrary. Neither the Warrants nor this Warrant Certificate entitles any holder hereof to any rights of a stockholder of the Company.

ELECTION TO PURCHASE

(TO BE EXECUTED UPON EXERCISE OF WARRANT)

The undersigned hereby irrevocably elects to exercise the right, represented by this Warrant Certificate, to receive shares of common stock, par value $0.0001 per share (the "***Common Stock***"), of Bionano Genomics, Inc., a Delaware corporation (the "***Company***") and herewith tenders payment for such shares to the order of the Company in the amount of $ in accordance with the terms hereof. The undersigned requests that a certificate for such shares be registered in the name of , whose address is and that such shares be delivered to whose address is . If said number of shares is less than all of the shares of Common Stock purchasable hereunder, the undersigned requests that a new Warrant Certificate representing the remaining balance of such shares be registered in the name of , whose address is , and that such Warrant Certificate be delivered to , whose address is .

In the event that the Warrant is to be exercised on a "***cashless***" basis pursuant to Section 3.4.2 of the Warrant Agreement, the number of shares of Common Stock that this Warrant is exercisable for shall be determined in accordance with Section 3.4.2 of the Warrant Agreement.

_____ a "***Cash Exercise***" with respect to Warrant Shares; and/or

_____ a "***Cashless Exercise***" with respect to Warrant Shares, resulting in a delivery obligation by the Company to the Holder of Common Stock representing the applicable Net Number, subject to adjustment.

In the event that the Warrant may be exercised, to the extent allowed by the Warrant Agreement, through cashless exercise (i) the number of shares that this Warrant is exercisable for would be determined in accordance with the relevant section of the Warrant Agreement which allows for such cashless exercise and (ii) the holder hereof shall complete the following: The undersigned hereby irrevocably elects to exercise the right, represented by this Warrant Certificate, through the cashless exercise provisions of the Warrant Agreement, to receive Common Stock. If said number of shares is less than all of the shares of Common Stock purchasable hereunder (after giving effect to the cashless exercise), the undersigned requests that a new Warrant Certificate representing the remaining balance of such shares be registered in the name of , whose address is , and that such Warrant Certificate be delivered to , whose address is _____.

Date: , 201

_____

(Signature)

_____

Address)

_____

_____

_____

(Tax Identification Number)

Exhibit 4.12

NUMBER **UNITS**

SEE REVERSE FOR
CERTAIN DEFINITIONS

BIONANO GENOMICS, INC.

CUSIP [•]

**UNITS CONSISTING OF ONE SHARE OF COMMON STOCK
AND ONE WARRANT TO PURCHASE ONE SHARE OF COMMON STOCK**

THIS CERTIFIES THAT [•] is the owner of [•] Units.

Each Unit ("**Unit**") consists of one (1) share of common stock, $0.0001 par value per share ("**Common Stock**"), of Bionano Genomics, Inc., a company incorporated under the laws of Delaware (the "**Company**"), and a warrant, with an exercise price of $[•] (subject to adjustment) to purchase one share of Common Stock

Each warrant will become exercisable on the first trading day following the 30th day after the date of effectiveness of the Company's registration statement on Form S-1 (No. 333-225970) (the "**Registration Statement**"), filed with the Securities and Exchange Commission (or such earlier date as set forth in the Warrant Agreement (as defined below)), and will expire on the date that is five years following the date of effectiveness of the Registration Statement. The warrants and shares of Common Stock will trade together as units only during the first 30 days following the date of effectiveness of the Registration Statement, and thereafter, the units will automatically separate and the Common Stock and warrants will trade separately, unless Roth Capital Partners, LLC, as representative of the underwriters, determines that an earlier date is acceptable based upon, among other things, its assessment of the relative strengths of the securities markets and small capitalization companies in general, and the trading pattern of, and demand for, the Company's securities in particular.

The terms of the warrants are governed by a Warrant Agreement, dated as of [•], 2018, by and between the Company and American Stock Transfer & Trust Company LLC, as Warrant Agent, and are subject to the terms and provisions contained therein, to all of which terms and provisions the holder of this certificate consents by acceptance hereof. Copies of the Warrant Agreement are on file at the office of the Warrant Agent located at 6201 15th Avenue, 3rd Floor, Brooklyn, NY 11219, and are available to any warrant holder upon written request and without cost.

This Unit Certificate shall be governed by and construed in accordance with the internal laws of the State of New York, without regard to conflicts of laws principles thereof.

This Unit Certificate is not valid unless countersigned by the Transfer Agent and Registrar of the Company.

Witness the facsimile signature of its duly authorized officers.

By _____
R. Erik Holmlin, Ph.D.
President and Chief Executive Officer

By _____
Mike Ward
Chief Financial Officer

Bionano Genomics, Inc.

The Company will furnish without charge to each shareholder who so requests, a statement of the powers, designations, preferences and relative, participating, optional or other special rights of each class of stock or series thereof of the Company and the qualifications, limitations, or restrictions of such preferences and/or rights.

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
TEN ENT – as tenants by the entireties
JT TEN – as joint tenants with right of survivorship and not as tenants in common

UNIF GIFT MIN ACT – under Uniform Gifts to Minors Act

Additional Abbreviations may also be used though not in the above list.

For value received, hereby sell, assign and transfer unto

PLEASE INSERT SOCIAL SECURITY OR OTHER IDENTIFYING NUMBER OF ASSIGNEE

(PLEASE PRINT OR TYPEWRITE NAME AND ADDRESS, INCLUDING ZIP CODE, OF ASSIGNEE)

Units represented by the within Certificate, and hereby irrevocably constitute(s) and appoint(s)

Attorney to transfer the said Units on the books of the within named Company with full power of substitution in the premises.

Dated:

Notice: The signature(s) to this assignment must correspond with the name(s) as written upon the face of the certificate in every particular, without alteration or enlargement or any change whatever.

Signature(s) Guaranteed:

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).

Cooley

Thomas A. Coll
1 858 550 6013
tcoll@cooley.com

August 15, 2018

Bionano Genomics, Inc.
9640 Towne Centre Drive, Suite 100
San Diego, CA 92121

Ladies and Gentlemen:

You have requested our opinion, as counsel to Bionano Genomics, Inc., a Delaware corporation (the "***Company***"), in connection with the filing by the Company of a Registration Statement (No. 333-225970) 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 (i) up to 2,817,500 units (the "***Units***") of the Company, including up to 367,500 Units that may be sold pursuant to the exercise of an option to purchase additional Units, with each Unit consisting of one share of common stock, par value $0.0001 per share (the "***Common Stock***"), of the Company (the "***Shares***"), and a warrant to purchase one share of Common Stock (the "***Warrants***"), and (ii) up to 2,817,500 shares of Common Stock issuable upon exercise of the Warrants (the "***Warrant Shares***"). All of the Units are to be sold by the Company as described in the Registration Statement and the Prospectus. The Warrants are to be issued pursuant to a Warrant Agreement between the Company and American Stock Trust & Transfer Company, LLC, as warrant agent (the "***Warrant Agreement***").

In connection with this opinion, we have (i) examined and relied upon (a) the Registration Statement and the Prospectus, (b) the Company's Eighth Amended and Restated Certificate of Incorporation and Bylaws, each as amended, as currently in effect, (c) the Company's Amended and Restated Certificate of Incorporation, filed as Exhibit 3.2 to the Registration Statement, and the Company's Amended and Restated Bylaws, filed as Exhibit 3.4 to the Registration Statement, each of which will be in effect immediately following the closing of the offering contemplated by the Registration Statement, and (d) the form of the Warrant Agreement filed as an exhibit to the Registration Statement, (e) the form of Unit Certificate filed as an exhibit to the Registration Statement and (f) 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 that the final terms of the sale and issuance of the Units will be authorized by the Board of Directors of the Company or a pricing committee thereof in accordance with Section 153 of the Delaware General Corporation Law (the "***DGCL***"). We have undertaken no independent verification with respect to such matters. 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 (other than by the Company) 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 law of the State of New York and the DGCL. We express no opinion as to whether the laws of any particular jurisdiction are applicable to the subject matter hereof. We are not rendering any opinion as to compliance with any federal or state antifraud law, rule or regulation relating to securities, or to the sale or issuance thereof.

On the basis of the foregoing, and in reliance thereon, we are of the opinion that: (i) the Units and the Warrants, when sold and issued against payment therefor as described in the Registration Statement and the Prospectus, will constitute valid and binding obligations of the Company, subject to applicable

bankruptcy, insolvency and similar laws affecting creditors' rights generally and to equitable principles of general applicability; (ii) the Shares, when sold and issued against payment therefor as described in the Registration Statement and the Prospectus, will be validly issued, fully paid and non-assessable; and (iii) the Warrant Shares, when issued and sold by the Company in accordance with the Warrant Agreement, 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/ Thomas A. Coll
Thomas A. Coll

Exhibit 10.1

FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT

August 5, 2016

To each of the Purchasers named in Exhibit A of the Series D-1 Convertible Participating Preferred Stock Purchase Agreement of even date herewith (collectively, and whether or not a single person or entity, the "Series D-1 Investors") and each of the other signatories hereto.

This will confirm that in consideration of the Series D-1 Investors' agreement on the date hereof to purchase shares of Series D-1 Convertible Participating Preferred Stock, par value $0.0001 per share (the "Series D-1 Preferred Stock"), of BioNano Genomics, Inc., a Delaware corporation and successor to BioNanomatrix, LLC (the "Company"), pursuant to the Series D-1 Convertible Participating Preferred Stock Purchase Agreement of even date herewith (as the same may be amended from time to time, the "Purchase Agreement") between the Company and the Series D-1 Investors and as an inducement to the Series D-1 Investors to consummate the transactions contemplated by the Purchase Agreement, the Company, the Series D-1 Investors and the other signatories hereto hereby agree as follows:

1. Certain Definitions. Any capitalized term used herein and not otherwise defined herein shall have the meaning ascribed to such term in the Eighth Amended and Restated Certificate of Incorporation of the Company, as the same may be amended from time to time (the "Charter"). In addition, as used in this Agreement (as defined below), the following terms shall have the following respective meanings:

"Affiliate" or "Affiliates" shall mean, with respect to any Person, an individual, firm, corporation, partnership, association, limited liability company, trust or any other entity who, directly or indirectly, controls, is controlled by or is under common control with such Person, including, without limitation, any partner, officer, director, member or employee of such Person and any venture capital fund now or hereafter existing that is controlled by or under common control with one or more general partners or shares the same management company with such Person.

"Agreement" shall mean this Fifth Amended and Restated Investors' Rights Agreement, as the same may be amended from time to time.

"Business Day" shall mean any day that is not a Saturday, Sunday or other day on which commercial banks located in the State of Delaware are authorized or required to be closed.

"Commission" shall mean the U.S. Securities and Exchange Commission or any other federal agency at the time administering the Securities Act.

"Common Stock" shall mean the Common Stock, par value $0.0001 per share, of the Company.

"Exchange Act" shall mean the Securities Exchange Act of 1934, as amended, or any successor federal statute, and the rules and regulations of the Commission thereunder, all as the same shall be in effect at the time.

"Founder" shall mean Han Cao.

"Investor Affiliate" or "Investor Affiliates" shall mean any person (i) who is an "affiliated person" of an Investor, as that term is defined in the Investment Company Act of 1940, as amended, (ii) who is a current or former partner, member or stockholder of an Investor, or (iii) who is managed by, or has the same management company or investment advisor or similar company, as an Investor.

"Investor" or "Investors" shall mean the Series A Investors, the Series B Investors, the Series B-1 Investors, the Series C Investors, the Series D Investors and the Series D-1 Investors, as well as any additional persons or entities becoming parties hereto in accordance with the terms hereof as an "Investor."

"Key Employee" or "Key Employees" shall mean and include the president, chief executive officer, chief financial officer, chief operating officer, chief technology officer, and any senior vice president of operations, finance, research, development, or sales or marketing.

"LC" shall mean LC Fund VI, L.P., LC Parallel Fund VI, L.P., LC HealthCare Fund I, and their Affiliates.

"Person" or "Persons" shall mean an individual, corporation, partnership, limited liability company, joint venture, trust, or unincorporated organization, or a government or any agency or political subdivision thereof.

"Preferred Stock" shall mean the Preferred Stock, par value $0.0001 per share, of the Company, and includes the Series A Preferred Stock, the Series B Preferred Stock, the Series B-1 Preferred Stock, the Series C Preferred Stock, the Series D Preferred Stock, and the Series D-1 Preferred Stock.

"Qualified Public Offering" shall mean the closing of the sale of shares of Common Stock to the public (i) in which the price per share paid by the public (prior to the deduction of underwriting discounts and registration expenses) multiplied by the fully-diluted outstanding shares of the Company immediately prior to such closing (inclusive of options, warrants, other convertible securities and shares reserved under any equity plan) is no less than $150,000,000 and (ii) resulting in at least $30,000,000 in gross proceeds to the Company (prior to the deduction of underwriting discounts and registration expenses), in a firm-commitment underwritten public offering pursuant to an effective registration statement under the Securities Act.

"Registrable Securities" shall mean (i) the Common Stock issuable or issued upon conversion of the Preferred Stock; (ii) any Common Stock issued or issuable upon conversion, exchange and/or exercise of any capital stock, options, warrants or convertible securities of the Company acquired by the Investors prior to or after the date hereof; (iii) solely for the purposes of Section 5 (and any analogous provisions) the Common Stock held by the Founder; and (iv) any Common Stock issued as (or issuable upon the conversion or exercise of any warrant, right or other security which is issued as) a dividend or other distribution with respect to, or in exchange for or in replacement of, the shares referenced in clause (i), (ii) and (iii) above; excluding in all cases, however, any Registrable Securities (a) sold to or through a broker or

dealer or underwriter in a public distribution or a public securities transaction, (b) sold in a transaction exempt from the registration and prospectus delivery requirements of the Securities Act under Section 4(1) thereof so that all transfer restrictions and restrictive legends with respect thereto are removed upon the consummation of such sale, (c) registered under the Securities Act pursuant to an effective registration statement filed thereunder, (d) publicly sold pursuant to Rule 144 under the Securities Act, (e) any shares of Common Stock described in this definition, if such shares of Common Stock could be sold under Rule 144 under the Securities Act, during any ninety (90) day period, or (f) sold in a transaction in which the rights granted under Sections 4, 5 or 6 hereof are not assigned in accordance with this Agreement.

"Securities Act" shall mean the Securities Act of 1933, as amended, or any successor federal statute, and the rules and regulations of the Commission thereunder, all as the same shall be in effect at the time.

"Series A Investors" shall mean the holders of Series A Preferred Stock party hereto and any additional persons or entities that become parties hereto.

"Series A Preferred Stock" shall mean the Series A Convertible Participating Preferred Stock of the Company, par value $0.0001 per share.

"Series B Investors" shall mean the holders of Series B Preferred Stock party hereto and any additional persons or entities that become parties hereto.

"Series B Preferred Stock" shall mean the Series B Convertible Participating Preferred Stock of the Company, par value $0.0001 per share.

"Series B-1 Investors" shall mean the holders of Series B-1 Preferred Stock party hereto and any additional persons or entities that become parties hereto.

"Series B-1 Preferred Stock" shall mean the Series B-1 Convertible Participating Preferred Stock of the Company, par value $0.0001 per share.

"Series C Investors" shall mean the holders of Series C Preferred Stock party hereto and any additional persons or entities that become parties hereto.

"Series C Preferred Stock" shall mean the Series C Convertible Participating Preferred Stock of the Company, par value $0.0001 per share.

"Series D Investors" shall mean the holders of Series D Preferred Stock party hereto and any additional persons or entities that become parties hereto.

"Series D Preferred Stock" shall mean the Series D Convertible Participating Preferred Stock of the Company, par value $0.0001 per share.

"Violation" means any loss, claim, damage or liability (joint or several) to which a party hereto may become subject under the Securities Act, the Exchange Act or other federal or state law, insofar as such loss, claim, damage or liability (or any action in respect thereof) arises out of or is based upon: (i) any untrue statement or alleged untrue statement of a material fact

contained in any registration statement of the Company, including any preliminary prospectus or final prospectus contained therein or any amendments or supplements thereto; (ii) an omission or alleged omission to state therein a material fact required to be stated therein, or necessary to make the statements therein not misleading; or (iii) any violation or alleged violation by any other party hereto of the Securities Act, the Exchange Act, any state securities law or any rule or regulation promulgated under the Securities Act, the Exchange Act or any state securities law.

2. Restrictive Legend. Each certificate representing Preferred Stock or Registrable Securities shall, except as otherwise provided in Section 3, be stamped or otherwise imprinted with a legend substantially in the following form:

> "THE SECURITIES REPRESENTED BY THIS CERTIFICATE HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933 OR APPLICABLE STATE SECURITIES LAWS. THESE SECURITIES HAVE BEEN ACQUIRED FOR INVESTMENT AND NOT WITH A VIEW TO DISTRIBUTION OR RESALE, AND MAY NOT BE SOLD, MORTGAGED, PLEDGED, HYPOTHECATED OR OTHERWISE TRANSFERRED WITHOUT AN EFFECTIVE REGISTRATION STATEMENT FOR SUCH SECURITIES UNDER THE SECURITIES ACT OF 1933 AND APPLICABLE STATE SECURITIES LAWS, OR AN OPINION OF COUNSEL SATISFACTORY TO THE COMPANY THAT SUCH TRANSFER IS EXEMPT FROM THE REGISTRATION PROVISIONS OF THE SECURITIES ACT OF 1933 AND APPLICABLE STATE SECURITIES LAWS."

3. Notice of Proposed Transfer. Subject in all events to the restrictions set forth in the Fifth Amended and Restated Stockholders Agreement dated as of the date hereof (the "Stockholders Agreement") regarding the transfer of capital stock, prior to any proposed sale, assignment, transfer or pledge (other than a pledge in favor of the Company) of any Preferred Stock or Registrable Securities (other than under the circumstances described in Sections 4, 5 or 6), the holder thereof shall give written notice to the Company of its intention to effect such sale, assignment, transfer or pledge. Each such notice shall describe the manner of the proposed sale, assignment, transfer or pledge in sufficient detail and, unless waived in writing by the Company, shall be accompanied by an opinion of counsel reasonably satisfactory to the Company to the effect that the proposed sale, assignment, transfer or pledge may be effected without registration under the Securities Act and any applicable state securities laws, whereupon the holder of such stock shall be entitled to transfer such stock in accordance with the terms of its notice delivered by the holder of such stock to the Company; provided, however, that no such opinion of counsel shall be required for a transfer made in accordance with all applicable securities laws (a) to one or more partners or members or retired partners or retired members (or to the estate of any such parties) of an Investor (in the case of an Investor that is a partnership or a limited liability company, as the case may be), (b) to an Investor Affiliate, (c) to a wholly-owned subsidiary of an Investor, or (d) by an Investor to its stockholders (in the case of an Investor that is a corporation). Each certificate for Preferred Stock or Registrable Securities transferred as above provided shall bear the legend set forth in Section 2, except that such certificate shall not bear such legend if (i)

such transfer is in accordance with the provisions of Rule 144 (or any other rule permitting public sale without registration under the Securities Act) or (ii) the opinion of counsel referred to above is to the further effect that the transferee and any subsequent transferee (other than an affiliate of the Company) would be entitled to transfer such securities in a public sale without registration under the Securities Act.

4. Required Registration.

(a) Any time after the earlier of (i) twelve (12) months following a Qualified Public Offering and (ii) the date that is four (4) years after the date of this Agreement, the holders of at least 66-2/3% of the shares of Preferred Stock then outstanding (or shares of Common Stock issued upon conversion of the shares of Preferred Stock or a combination thereof) may request the Company to register under the Securities Act all or any portion of the shares of Registrable Securities held by such requesting holder or holders for sale in the manner specified in such notice; provided, however, that the shares of Registrable Securities for which registration has been requested shall be at least 20% of the shares of Registrable Securities then held by such requesting holder or holders (or a lesser percentage if the anticipated gross receipts from the offering would exceed $40,000,000).

(b) Following receipt of any notice under this Section 4, the Company shall, within twenty (20) days of receipt thereof, notify all holders of Registrable Securities and Preferred Stock from whom notice has not been received and such holders shall then be entitled within thirty (30) days thereafter to request the Company to include in the requested registration all or any portion of their shares of Registrable Securities. The Company shall use its reasonable best efforts to register under the Securities Act, for public sale in accordance with the method of disposition described in paragraph (a) above, the number of shares of Registrable Securities specified in such notice (and in all notices received by the Company from other holders within thirty (30) days after the giving of such notice by the Company). The Company shall be obligated to register Registrable Securities pursuant to this Section 4 on two (2) occasions only; provided, however, that such obligation shall be deemed satisfied only when (i) a registration statement covering all shares (or such lesser number as permitted by Section 4(d) below) of Registrable Securities specified in notices received as aforesaid (and not subsequently withdrawn) for sale in accordance with the method of disposition specified by the requesting holders shall have become effective and remain effective for the period of distribution contemplated thereby (unless such requesting holders request that such registration statement be withdrawn, in which case such obligation of the Company shall be deemed satisfied unless such requesting holders pay all Registration Expenses (as defined in Section 8) incurred in connection with the withdrawn registration statement), and (ii) where such registration statement has become effective, if such method of disposition is a firm commitment underwritten public offering, and all such shares shall have been sold to the underwriters pursuant thereto (not including shares eligible for sale pursuant to the underwriters' over-allotment option). The Company shall not be obligated to effect, or to take any action to effect, any registration pursuant to this Section 4: (i) during the period within ninety (90) days after the effective date of a registration pursuant to Section 4 or Section 6 hereof, or in which the holders of Registrable Securities shall have been entitled to join pursuant to Section 5; (ii) if the shares of Registrable Securities to be registered may be immediately registered on Form S-3; or (iii) during the period

within twelve (12) months after the closing of an initial public offering of Common Stock by the Company.

(c) The Company shall be entitled to include in any registration statement referred to in this Section 4 shares of Common Stock to be sold by the Company for its own account, except as and to the extent that, in the opinion of the managing underwriter, such inclusion would adversely affect the marketing of the Registrable Securities to be sold. Subject to Section 14(h) and except for registration statements on Form S-4, S-8 or any successor thereto, the Company will not file with the Commission any other registration statement with respect to its Common Stock, whether for its own account or that of other stockholders, from the date of receipt of a notice from requesting holders requesting sale pursuant to an underwritten offering pursuant to this Section 4 until thirty (30) days after the date such registration statement is declared effective. The right of any holder to include such holder's Registrable Securities in an underwritten registration shall be conditioned upon such holder's participation in such underwriting and the inclusion of such holder's Registrable Securities in the underwriting to the extent provided herein. All holders proposing to distribute their securities through such underwriting shall (together with the Company) enter into an underwriting agreement in reasonable and customary form with the underwriter or underwriters selected for such underwriting.

(d) If in the opinion of the managing underwriter the inclusion of all of the Registrable Securities requested to be registered under this Section 4 would adversely affect the marketing of such shares, shares to be sold by the holders of Registrable Securities shall be excluded only after any shares to be sold by the Company and any other parties including shares for sale in such registration have been excluded, in such manner that the shares to be sold shall be allocated among the requesting holders pro rata based on their ownership of Registrable Securities. In the event the number of shares to be sold by requesting holders of Registrable Securities pursuant to an underwritten registration under this Section 4 is reduced pursuant to this Section 4(d), such registration shall still count towards satisfaction of the Company's obligation to register shares under this Section provided that such registration includes at least 40% of the shares of Registrable Securities so requested to be included by the requesting holders.

5. Incidental Registration. If the Company at any time (other than pursuant to Section 4 or Section 6), proposes to register any of its securities under the Securities Act for sale to the public, whether for its own account or for the account of other security holders or both (except with respect to registration statements on Forms S-4, S-8 or another form not available for registering the Registrable Securities for sale to the public), each such time it will give written notice to all holders of outstanding Registrable Securities (including, solely for purpose of this Section 5, the Founder) of its intention so to do. Upon the written request of any such holder, received by the Company within thirty (30) days after the giving of any such notice by the Company, to register any of its Registrable Securities, the Company will use its reasonable best efforts to cause the Registrable Securities as to which registration shall have been so requested to be included in the securities to be covered by the registration statement proposed to be filed by the Company, all to the extent requisite to permit the sale or other disposition by the holder of such Registrable Securities so registered. In the event that any registration pursuant to this Section 5 shall be, in whole or in part, an underwritten public offering of Common Stock, the number of shares of Registrable Securities to be included in such an underwriting may be

reduced (pro rata among the requesting holders based upon the number of shares of Registrable Securities owned by such holders) if and to the extent that the managing underwriter shall be of the opinion that such inclusion would adversely affect the marketing of the securities to be sold by the Company therein, provided, however, that such number of shares of Registrable Securities shall not be reduced if any shares are to be included in such underwriting for the account of any person other than the Company or requesting holders of Registrable Securities. Notwithstanding the foregoing, the Company may withdraw any registration statement referred to in this Section 5 without thereby incurring any liability to the holders of Registrable Securities.

6. Registration on Form S-3. If at any time (i) a holder or holders of Registrable Securities request that the Company file a registration statement on Form S-3 or any successor thereto for a public offering of all or any portion of the shares of Registrable Securities held by such requesting holder or holders, and (ii) the Company is a registrant entitled to use Form S-3 or any successor thereto to register such shares, then the Company shall use its reasonable best efforts to register under the Securities Act on Form S-3 or any successor thereto, for public sale in accordance with the method of disposition specified in such notice, the number of shares of Registrable Securities specified in such notice; provided, however, that the shares of Registrable Securities for which registration has been requested have a reasonably anticipated aggregate offering price to the public of at least $3,000,000. Whenever the Company is required by this Section 6 to use its reasonable best efforts to effect the registration of Registrable Securities, each of the procedures and requirements of Section 4 (including but not limited to the requirement that the Company notify all holders of Registrable Securities from whom notice has not been received and provide them with the opportunity to participate in the offering) shall apply to such registration, provided, however, that there shall be no limitation on the number of registrations on Form S-3 which may be requested and obtained under this Section 6.

7. Registration Procedures. If and whenever the Company is required by the provisions of Sections 4, 5 or 6 to use its reasonable best efforts to effect the registration of any shares of Registrable Securities under the Securities Act, the Company will, as expeditiously as reasonably possible under the circumstances:

(a) prepare and file with the Commission a registration statement (which, in the case of an underwritten public offering pursuant to Section 4, shall be on Form S-1 or other form of general applicability satisfactory to the managing underwriter selected as therein provided) with respect to such securities and use its reasonable best efforts to cause such registration statement to become and remain effective for the period of the distribution contemplated thereby (determined as hereinafter provided);

(b) prepare and file with the Commission such amendments and supplements to such registration statement and the prospectus used in connection therewith as may be necessary to keep such registration statement effective for the period specified in paragraph (a) above and comply with the provisions of the Securities Act with respect to the disposition of all Registrable Securities covered by such registration statement in accordance with the sellers' intended method of disposition set forth in such registration statement for such period;

(c) furnish to each seller of Registrable Securities and to each underwriter such number of copies of the registration statement and the prospectus included therein

(including each preliminary and final prospectus) and such other documents as such persons reasonably may request in order to facilitate the public sale or other disposition of the Registrable Securities covered by such registration statement;

(d) use commercially reasonable efforts to register or qualify the Registrable Securities covered by such registration statement under the securities or "blue sky" laws of such jurisdictions as the sellers of Registrable Securities or, in the case of an underwritten public offering, the managing underwriter reasonably shall request, provided, however, that the Company shall not be required in connection therewith or as a condition thereto to qualify to do business in any states or jurisdictions in which it is not, at the time, so qualified, or otherwise subject itself to general taxation in any such states or jurisdictions;

(e) use its reasonable best efforts to list the Registrable Securities covered by such registration statement to be listed on a national securities exchange or trading system and each securities exchange and trading system on which similar securities issued by the Company are then listed (if any);

(f) provide a transfer agent and registrar for all Registrable Securities registered pursuant hereunder and a CUSIP number for all such Registrable Securities, in each case not later than the effective date of such registration;

(g) promptly notify each seller of Registrable Securities and each underwriter under such registration statement, at any time when a prospectus relating thereto is required to be delivered under the Securities Act, of the happening of any event of which the Company has knowledge as a result of which the prospectus contained in such registration statement, as then in effect, includes an untrue statement of a material fact or omits to state a material fact required to be stated therein or necessary to make the statements therein not misleading in light of the circumstances then existing. The holders of Registrable Securities covered by such registration statement agree upon receipt of such notice forthwith to cease making offers and sales of Registrable Securities pursuant to such registration statement or deliveries of the prospectus contained therein for any purpose until the Company has prepared and furnished such amendment or supplement to the prospectus as may be necessary so that, as thereafter delivered to purchasers of such Registrable Securities, such prospectus shall not include an untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary to make the statements therein not misleading in the light of the circumstances then existing. The Company shall promptly prepare and furnish such amendment or supplement to the prospectus to each such seller of Registrable Securities and each such underwriter;

(h) if the offering is underwritten use its reasonable best efforts to furnish on the date that Registrable Securities are first delivered to the underwriters for sale pursuant to such registration: (i) an opinion dated such date of counsel representing the Company for the purposes of such registration, addressed to the underwriters stating that such registration statement has become effective under the Securities Act and that (A) to the knowledge of such counsel, no stop order suspending the effectiveness thereof has been issued and no proceedings for that purpose have been instituted or are pending or contemplated under the Securities Act, (B) the registration statement, the related prospectus and each amendment or supplement thereof comply as to form in all material respects with the requirements of the Securities Act (except that

such counsel need not express any opinion as to financial statements contained therein) and (C) to such other effects as reasonably may be requested by counsel for the underwriters or by such seller or its counsel and (ii) a letter dated such date from the independent public accountants retained by the Company, addressed to the underwriters, stating that they are independent registered public accounting firm within the meaning of the Securities Act and that, in the opinion of such accountants, the financial statements of the Company included in the registration statement or the prospectus, or any amendment or supplement thereof, comply as to form in all respects with the applicable accounting requirements of the Securities Act, and such letter shall additionally cover such other financial matters (including information as to the period ending no more than five (5) Business Days prior to the date of such letter) with respect to such registration as such underwriters reasonably may request;

(i) make available for inspection by each seller of Registrable Securities, any underwriter participating in any distribution pursuant to such registration statement, and any attorney, accountant or other agent retained by such seller or underwriter, all relevant financial and other records, pertinent corporate documents and properties of the Company, and cause the Company's officers, directors and employees to supply all information reasonably requested by any such seller, underwriter, attorney, accountant or agent in connection with such registration statement, provided such parties agree to keep such information confidential;

(j) advise each selling holder of Registrable Securities, promptly after it shall receive notice or obtain knowledge thereof, of the issuance of any stop order by the Commission suspending the effectiveness of such registration statement or the initiation or threatening of any proceeding for such purpose and promptly use all commercially reasonable efforts to prevent the issuance of any stop order or to obtain its withdrawal if such stop order should be issued;

(k) cooperate with the selling holders of Registrable Securities and the managing underwriters, if any, to facilitate the timely preparation and delivery of certificates representing Registrable Securities to be sold, such certificates to be in such denominations and registered in such names as such holders or the managing underwriters may request at least two (2) Business Days prior to any sale of Registrable Securities;

(l) permit any holder of Registrable Securities, which holder, in the sole and exclusive judgment, exercised in good faith, of such holder, might be deemed to be a controlling person of the Company, to participate in good faith in the preparation of such registration or comparable statement; and

(m) use its commercially reasonable efforts to prevent the issuance, and, if issued, to obtain the withdrawal, of any order suspending the effectiveness of any registration statement at the earliest possible time.

For purposes of Section 7(a) and 7(b) and of Section 4(b), the period of distribution of Registrable Securities in a firm commitment underwritten public offering shall be deemed to extend until the earlier of such time as each underwriter has completed the distribution of all securities purchased by it, and one hundred eighty (180) days after the effective date thereof. The period of distribution of Registrable Securities in any other

registration shall be deemed to extend until the earlier of the sale of all Registrable Securities covered thereby and one hundred eighty (180) days after the effective date thereof.

In connection with each registration hereunder, the sellers of Registrable Securities will furnish to the Company in writing such information with respect to themselves and the proposed distribution by them as reasonably shall be requested by the Company or as shall be necessary in order to assure compliance with federal and applicable state securities laws.

In connection with each registration pursuant to Sections 4, 5 or 6 covering an underwritten public offering, the Company and each seller of Registrable Securities agrees to enter into a written agreement with the managing underwriter selected in the manner herein provided in such form and containing such provisions as are reasonable and customary in the securities business for such an arrangement between such underwriter and companies of the Company's size and investment stature.

Any managing underwriter engaged by the Company in any registration made pursuant to Sections 4 or 6 shall require the approval in writing of the holders of a majority of the Preferred Stock requesting such registration.

It shall be a condition precedent to the obligations of the Company to take any action pursuant to Sections 4, 5, 6 or 7 with respect to the Registrable Securities of any selling holder that such holder shall furnish to the Company such information regarding itself, the Registrable Securities held by it, and the intended method of disposition of such securities as shall be reasonably necessary to effect the registration of such holder's Registrable Securities.

8. Expenses. All expenses incurred by the Company in complying with Sections 4, 5, 6 or 7, including, without limitation, all registration and filing fees, printing expenses, fees and disbursements of counsel and independent public accountants for the Company, fees and expenses (including counsel fees) incurred in connection with complying with state securities or "blue sky" laws, fees of the National Association of Securities Dealers, Inc., fees of transfer agents and registrars, costs of insurance, and reasonable and documented fees and disbursements of one counsel for the sellers of Registrable Securities (which shall not exceed $50,000 per registration) ("Agreed Counsel Fees"), but excluding any Selling Expenses, are called "Registration Expenses." All underwriting discounts and selling commissions applicable to the sale of Registrable Securities and the fees and expenses of any counsel to the sellers other than the Agreed Counsel Fees are called "Selling Expenses."

(a) The Company will pay all Registration Expenses in connection with each registration under Sections 4, 5 or 6. All Selling Expenses in connection with each registration under Sections 4, 5 or 6 shall be borne by the participating sellers (including the Company to the extent the Company shall be a participating seller) in proportion to the number of shares sold by each, or by such participating sellers as they may otherwise agree in writing.

(b) The Company will not be required to pay for Registration Expenses of any registration proceeding begun pursuant to Sections 4, 5 or 6, the request of which has been subsequently withdrawn by the initiating holders of Registrable Securities, unless (i) the withdrawal is based upon material adverse information concerning the Company which was not

provided to the initiating holders at the time of such request, or (ii) the holders of a majority of Registrable Securities agree to forfeit their right to one requested registration pursuant to Sections 4 or 6, as applicable (in which event such right shall be forfeited by all holders). If the holders are required to pay the Registration Expenses, such expenses shall be borne by the holders of the securities (including Registrable Securities) requesting such registration in proportion to the number of securities for which such registration is requested or as otherwise agreed in writing by such holders. If the Company is required to pay the Registration Expenses of a withdrawn offering pursuant to clause (i) above, then the holders of Registrable Securities shall not forfeit their rights to a registration pursuant to Sections 4 or 6, as applicable.

9. Indemnification and Contribution.

(a) In the event of a registration of any of the Registrable Securities under the Securities Act pursuant to Sections 4, 5 or 6, the Company will indemnify, defend and hold harmless each seller of such Registrable Securities thereunder (each, a "Selling Holder"), the partners, members, officers, directors, managers and stockholders of each such Selling Holder, legal counsel and accountants for each Selling Holder, any underwriter (as defined in the Securities Act) for such Selling Holder and each Person, if any, who controls such Selling Holder or underwriter within the meaning of the Securities Act or the Exchange Act, against any Violation, and the Company will pay to each such Selling Holder, underwriter, controlling Person or other aforementioned Person any legal or other expenses incurred thereby in connection with investigating or defending any Violation as such expenses are incurred; provided, however, that the indemnity agreement contained in this subsection 9(a) shall not apply to: (x) amounts paid in settlement of any such Violation if such settlement is effected without the consent of the Company (which consent shall not be unreasonably withheld, conditioned or delayed), (y) any such Violation solely to the extent that it arises out of or is based upon and in conformity with written information furnished expressly for use in connection with such registration by such Selling Holder, underwriter, controlling Person or other aforementioned Person or (z) any such Violation solely to the extent that it arises out of or is based upon such Selling Holder's, underwriter's, controlling Person's or other aforementioned Person's failure to deliver a copy of the registration statement or prospectus or any amendments or supplements thereto or such Selling Holder's, underwriter's, controlling Person's or other aforementioned Person's failure to cease making offers and sales of Registrable Securities pursuant to a registration statement or deliveries of the prospectus contained therein in accordance with Section 7(g) hereof.

(b) Each Selling Holder, severally and not jointly, will indemnify, defend and hold harmless the Company, each of its directors, each of its officers who has signed the registration statement, each Person, if any, who controls the Company within the meaning of the Securities Act, legal counsel and accountants for the Company, any underwriter (as defined in the Securities Act), any other Selling Holder selling securities in such registration statement and any controlling Person of any such underwriter or other Selling Holder, against any Violation, in each case solely to the extent that such Violation arises out of or is based upon actions or omissions made in reliance upon and in conformity with written information furnished by such Selling Holder expressly for use in connection with such registration; and each such Selling Holder will pay to the Company and each other aforementioned Person any legal or other expenses reasonably incurred thereby in connection with investigating or defending any

Violation as such expenses are incurred; provided, however, that the indemnity agreement contained in this subsection 9(b) shall not apply to amounts paid in settlement of any such Violation if such settlement is effected without the consent of such Selling Holder, which consent shall not be unreasonably withheld; and provided further, that, in no event shall any indemnity under this subsection 9(b) exceed the proceeds from the offering (net of any Selling Expenses) received by such Selling Holder, except in the case of fraud or willful misconduct by such Selling Holder.

(c) Promptly after receipt by an indemnified party hereunder of notice of the commencement of any action, such indemnified party shall, if a claim in respect thereof is to be made against the indemnifying party hereunder, notify the indemnifying party in writing thereof, but the omission so to notify the indemnifying party shall not relieve it from any liability which it may have to such indemnified party other than under this Section 9 and shall only relieve it from any liability which it may have to such indemnified party under this Section 9 if and to the extent the indemnifying party is prejudiced by such omission. In case any such action shall be brought against any indemnified party and it shall notify the indemnifying party of the commencement thereof, the indemnifying party shall be entitled to participate in and, to the extent it shall wish, to assume and undertake the defense thereof with counsel reasonably satisfactory to such indemnified party, and, after notice from the indemnifying party to such indemnified party of its election so to assume and undertake the defense thereof, and the indemnifying party shall not be liable to such indemnified party under this Section 9 for any legal expenses subsequently incurred by such indemnified party in connection with the defense thereof other than reasonable costs of investigation and of liaison with counsel so selected, provided, however, that, if the defendants in any such action include both the indemnified party and the indemnifying party and the indemnified party shall have reasonably concluded that there may be reasonable defenses available to it which are different from or additional to those available to the indemnifying party or if the interests of the indemnified party reasonably may reasonably be deemed to conflict with the interests of the indemnifying party, the indemnified party shall have the right to select a separate counsel reasonably satisfactory to the indemnifying party and to assume such legal defenses and otherwise to participate in the defense of such action, with the reasonable expenses and fees of up to one such separate counsel for all indemnified parties with respect to such action and other reasonable expenses related to such participation to be reimbursed by the indemnifying party as incurred.

(d) In order to provide for just and equitable contribution to joint liability under the Securities Act in any case in which either (i) any party otherwise entitled to indemnification pursuant to this Section 9 (the "Indemnified Party") makes a claim for indemnification pursuant to this Section 9 but it is judicially determined (by the entry of a final judgment or decree by a court of competent jurisdiction and the expiration of time to appeal or the denial of the last right of appeal) that such indemnification may not be enforced in such case notwithstanding the fact that this Section 9 provides for indemnification in such case, or (ii) contribution under the Securities Act may be required on the part of any such Indemnified Party in circumstances for which indemnification is provided under this Section 9; then, and in each such case, the Company and such holder will contribute to the aggregate losses, claims, damages or liabilities to which they may be subject (after contribution from others) in such proportion as is appropriate to reflect the relative fault of the party otherwise required to provide indemnification (the "Indemnifying Party") on the one hand, and of the Indemnified Party on the

other, taking into account any other relevant equitable considerations. The relative fault of the parties shall be determined by reference to, among other things, whether the untrue or alleged untrue statement of a material fact or the omission to state a material fact relates to information supplied by the Indemnifying Party or by the Indemnified Party and the parties' relative intent, knowledge, access to information and opportunity to correct such statement or omission; provided, however, that, in any such case, (A) no such holder will be required to contribute any amount in excess of the net proceeds (exclusive of applicable taxes and net of any Selling Expenses) received by such holder from the sale of all Registrable Securities offered by it pursuant to such registration statement; and (B) no person or entity guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Securities Act) will be entitled to contribution from any person or entity who was not guilty of such fraudulent misrepresentation.

(e) The Company shall indemnify, defend and hold harmless each Investor and their respective direct and indirect subsidiaries and affiliates and their respective officers, directors, managers, employees, stockholders, members, partners, agents, controlling persons and other representatives (collectively, the "Investor Indemnitees") against any and all Losses of such Investor Indemnitee resulting from or arising out of any third party or governmental action or claim based upon the Investor Indemnitee's status as a security holder of the Company (including, without limitation, any and all Losses arising under the Securities Act, the Exchange Act, or similar securities law, any other federal or state statute, rule, regulation or law, or otherwise, which relate directly or indirectly to the registration, purchase, sale or ownership of any securities of the Company or to any fiduciary obligation owed with respect thereto), including, without limitation, in connection with any third party or governmental action or claim relating to any action taken or omitted to be taken or alleged to have been taken or omitted to have been taken by such Investor Indemnitee as a security holder. Notwithstanding the foregoing, the Company shall not be obligated to indemnify or hold harmless any Investor Indemnitee under this Section 9(e) against any Losses resulting from or arising out of any third party or governmental action or claim if it has been finally determined by a court or other trier of fact of competent jurisdiction that such Losses were the result of (i) any action or omission made by the Investor Indemnitee in bad faith or (ii) any criminal action on the part of such Investor Indemnitee. For purposes of this Section 9(e), "Losses" means all losses, claims (including any claim by a third party), damages, liabilities, reasonable expenses (including reasonable fees, disbursements and other charges of counsel incurred by the Investor Indemnitee in connection with any claim, action, suit or proceeding, including any action between the Investor Indemnitee and the Company or between the Investor Indemnitee and any third party). In connection with the obligation of the Company to indemnify for expenses as set forth in this Section 9(e), the Company shall reimburse each Investor Indemnitee as promptly as practical after the receipt by the Company of a written statement or statements from an Investor Indemnitee requesting such reimbursement for all such reasonable expenses (including reasonable expenses of investigation and reasonable fees, disbursements and other charges of counsel in connection with any claim, action, suit or proceeding) as they are incurred by such Investor.

Unless otherwise superseded by an underwriting agreement entered into in connection with an underwritten public offering, the obligations of the Company and the Selling Holders under this Section 9 shall survive the completion of any offering of Registrable Securities in a registration statement under this Section 9, and otherwise and shall survive the termination of this Agreement.

10. Changes in Common Stock or Preferred Stock. If, and as often as, there is any change in the Common Stock or the Preferred Stock by way of a stock split, stock dividend, combination or reclassification, or through a merger, consolidation, reorganization or recapitalization, or performance-based adjustment or by any other means, appropriate adjustment shall be made in the provisions hereof so that the rights and privileges granted hereby shall continue with respect to the Common Stock and the Preferred Stock as so changed. All shares of capital stock held or acquired by an "affiliated person" of an Investor, as that term is defined in the Investment Company Act of 1940, as amended, shall be aggregated together for the purpose of determining the availability of any rights under this Agreement.

11. Rule 144 Reporting. With a view to making available the benefits of certain rules and regulations of the Commission which may at any time permit the sale of the Registrable Securities to the public without registration, at all times after ninety (90) days after any registration statement covering a public offering of securities of the Company under the Securities Act shall have become effective or following registration under Section 12 of the Exchange Act, the Company agrees to use reasonable best efforts to:

(a) make and keep public information available, as those terms are understood and defined in Rule 144 under the Securities Act;

(b) use its reasonable best efforts to file with the Commission in a timely manner all reports and other documents required of the Company under the Securities Act and the Exchange Act; and

(c) furnish or make available to each holder of Registrable Securities forthwith upon request a written statement by the Company as to its compliance with the reporting requirements of such Rule 144 and of the Securities Act and the Exchange Act, a copy of the most recent annual or quarterly report of the Company, and such other reports and documents so filed by the Company as such holder may reasonably request in availing itself of any rule or regulation of the Commission allowing such holder to sell any Registrable Securities without registration.

12. Preemptive Right.

(a) Preemptive Right. The Company shall not issue, sell or exchange, agree or obligate itself to issue, sell or exchange, or reserve or set aside for issuance, sale or exchange, any (i) shares of Common Stock, (ii) any other equity security of the Company, including without limitation, Preferred Stock, (iii) any debt security of the Company (other than debt with no equity feature) including without limitation, any debt security which by its terms is convertible into or exchangeable for any equity security of the Company, (iv) any security of the Company that is a combination of debt and equity, or (v) any option, warrant or other right to subscribe for, purchase or otherwise acquire any such equity security or any debt security of the Company specified in (i)-(iv) above, unless in each case the Company shall have first offered to sell a portion of such securities (the "Offered Securities") to each Investor who holds at least 5% of the then outstanding shares of Preferred Stock (each an "Offeree" and collectively, the "Offerees") as follows: each Offeree shall have the right (but not an obligation) to purchase (x) up to that portion of the Offered Securities as the number of shares of capital stock then held by

such Offeree (assuming for such purposes exercise, conversion and exchange of all outstanding options, warrants or convertible securities of the Company exercisable, convertible and/or exchangeable into shares of Common Stock) bears to the total number of the outstanding shares of capital stock of the Company (assuming for such purposes exercise, conversion and exchange of all outstanding options, warrants or convertible securities of the Company exercisable, convertible and/or exchangeable into shares of Common Stock) (the "Basic Amount"), and (y) such additional portion of the Offered Securities as such Offeree shall indicate it will purchase should the other Offerees subscribe for less than their respective Basic Amounts (the "Undersubscription Amount"), at a price and on such other terms as shall have been specified by the Company in writing delivered to such Offeree (the "Offer"), which Offer by its terms shall remain open and irrevocable for a period of thirty (30) days from receipt thereof. The Offer shall disclose the identity of the proposed transferee, the Offered Securities proposed to be sold, and the terms and conditions (including price) of the proposed sale.

(b) Notice of Acceptance. Notice of each Offeree's intention to accept, in whole or in part, any Offer made pursuant to Section 12(a) shall be evidenced by a writing signed by such Offeree and delivered to the Company prior to the end of the thirty (30) day period of such Offer, setting forth such of the Offeree's Basic Amount as such Offeree elects to purchase and, if such Offeree shall elect to purchase all of its Basic Amount, such Undersubscription Amount as such Offeree shall elect to purchase (the "Notice of Acceptance"). If the Basic Amounts subscribed for by all Offerees are less than the total Offered Securities available for purchase by all Offerees, then each Offeree who has set forth an Undersubscription Amount in its Notice of Acceptance shall be entitled to purchase, in addition to the Basic Amount subscribed for, the full Undersubscription Amount it has subscribed for; provided, however, that should the Undersubscription Amounts subscribed for exceed the difference between the Offered Securities available for purchase by all Offerees and the Basic Amounts subscribed for (the "Available Undersubscription Amount"), each Offeree who has subscribed for any Undersubscription Amount shall be entitled to purchase only that portion of the Available Undersubscription Amount as the Undersubscription Amount subscribed for by such Offeree bears to the total Undersubscription Amounts subscribed for by all Offerees, subject to rounding by the Board of Directors to the extent it reasonably deems necessary.

(c) Conditions to Acceptances and Purchase.

(i) Permitted Sales of Remaining Securities. The Company shall have ninety (90) days after the expiration of the period set forth in Section 12(a) to close the sale of all or any part of such Offered Securities as to which a Notice of Acceptance has not been given by the Offerees (the "Remaining Securities") to the Person or Persons specified in the Offer, but only in all material respects upon terms and conditions, including, without limitation, price and interest rates, which are no more favorable, in the aggregate, to such other Person or Persons or less favorable to the Company than those set forth in the Offer.

(ii) Reduction in Amount of Offered Securities. In the event the Company shall propose to sell less than all the Remaining Securities (any such sale to be in the manner and on the terms specified in Section 12(c)(i) above), then each Offeree may, at its sole option and in its sole discretion, reduce the number of Offered Securities specified in its respective Notices of Acceptance to an amount which shall be not less than the amount of the

Offered Securities which the Offeree elected to purchase pursuant to Section 12(b) multiplied by a fraction, (i) the numerator of which shall be the amount of Offered Securities which the Company actually proposes to sell, and (ii) the denominator of which shall be the amount of all Offered Securities. In the event that any Offeree so elects to reduce the number or amount of Offered Securities specified in its respective Notices of Acceptance, the Company may not sell or otherwise dispose of more than the reduced amount of the Offered Securities until a portion of such securities have again been offered to the Offerees in accordance with Section 12(a).

(iii) Closing. Upon the closing, which shall include full payment to the Company, of the sale to such other Person or Persons of all or less than all the Remaining Securities, the Offerees shall purchase from the Company, and the Company shall sell to the Offerees, the number of Offered Securities specified in the Notices of Acceptance, as may be reduced pursuant to this Section 12, upon the terms and conditions specified in the Offer.

(d) Further Sale. In each case, any Offered Securities not purchased by the Offerees or other Person or Persons in accordance with Section 12(c) may not be sold or otherwise disposed of until such securities are again offered to the Offerees under the procedures specified in Sections 12(a), 12(b) and 12(c).

(e) Termination of Preemptive Right. The rights of the Offerees under this Section 12 shall terminate immediately prior to, but subject to, the consummation of a firm-commitment underwritten public offering of Common Stock pursuant to an effective registration statement filed under the Securities Act; provided, however, that the rights of the Offerees pursuant to this Section 12 may be waived as to all of such Offerees holding Preferred Stock by the affirmative vote or written consent of the holders of at least 66-2/3% of the shares of Preferred Stock (the "Requisite Holders"), and any such waiver shall be binding on all Offerees holding shares of Preferred Stock with respect to their Preferred Stock, even if any of such Offerees do not execute such waiver and irrespective of whether one or more Offerees participates in the purchase of the Offered Securities; provided further, however, that, with respect to any such waiver of rights pursuant to this Section 12(e), if the Offerees voting in favor or consenting to such waiver subsequently participate in the purchase of the Offered Securities for which such waiver was obtained, then the remaining Offerees not providing such waiver will be granted the right to participate in the purchase of the Offered Securities, on a pro-rata basis amongst all the Offerees participating in such sale.

(f) Exception. The rights under this Section 12 shall not apply to any Exempted Securities, or to any Common Stock issued after the date hereof in connection with a Qualified Public Offering.

The exercise or non-exercise by an Investor of its rights pursuant to this Section 12 shall be without prejudice to its rights under this Section 12 with respect to future sales of Offered Securities.

13. Covenants of the Company and the Investors.

(a) Affirmative Covenants of the Company. Without limiting any other covenants and provisions hereof, and except to the extent the following covenants and provisions

of this Section 13(a) are waived in writing in any instance by the Requisite Holders, the Company covenants and agrees that until the consummation of a Qualified Public Offering, so long as any shares of Preferred Stock are outstanding, it will perform and observe the following covenants and provisions:

(i) Maintenance of Insurance. Maintain from responsible and reputable insurance companies or associations (x) a term life insurance policy on the life of Erik Holmlin (the "CEO") in the amount of at least $2,000,000, and (y) a term life insurance policy on the life of Han Cao (the "CSO") in the amount of at least $1,000,000, in each case, so long as such person remains an employee of the Company and the proceeds of which will be payable to the order of the Company. The Company will not cause or permit any assignment of the proceeds of the life insurance policy specified in the first sentence of this paragraph and will not borrow against such policies. In addition, the Company will maintain Directors and Officers insurance from a responsible and reputable insurance company or association and in an amount and on terms satisfactory to the Requisite Holders.

(ii) Inspection. Permit, upon reasonable request and prior notice, each holder of not less than 5% of the Preferred Stock (each such holder, as applicable, a "Major Investor"), or an agent or representative thereof, to examine and make copies of and extracts from the books of account of, and visit and inspect the properties of the Company and any subsidiary, to discuss the affairs, finances and accounts of the Company and any subsidiary with any of its officers, directors or Key Employees and independent accountants, and consult with and advise the management of the Company and any subsidiary as to their affairs, finances and accounts, all at reasonable times during the Company's normal business hours.

(iii) Indemnification. As promptly as practicable following the election of a director, enter into a director indemnification agreement in a usual and customary form with each such director, and as mutually agreed upon between the Company and such director.

(iv) Meetings of Directors. Call meetings of the Company's Board of Directors at least once every two (2) months, unless the Board of Directors unanimously shall determine otherwise. Ensure that a meeting of the Board of Directors may be called by any two (2) directors or by the holders of at least 20% of the Preferred Stock.

(v) Expenses of Directors. Promptly reimburse in full, each director of the Company who is not an employee of the Company for all of his or her reasonable and documented out-of-pocket expenses incurred in attending each meeting of the Board of Directors of the Company or any committee thereof, and for attendance at or participation in any other activities (including without limitation meetings, trade shows and conferences) which are required and/or requested by the Board of Directors in connection with such director's service on the Board of Directors.

(vi) Stock Options. All stock option grants and sales of stock to employees, officers, consultants, advisors and service providers of the Company shall be pursuant to a stock plan approved by the Board of Directors and shall be approved by the Board of Directors or a Compensation Committee thereof. Unless otherwise approved by the Board of Directors, (a) the exercise price of all such stock options and the sale price of all such sales shall

be no less than the fair market value of the Common Stock underlying such options or shares being sold, as applicable, as of the respective dates of grant or sale, as determined by the Board of Directors or Compensation Committee of the Board of Directors, and (b) all such options, stock or stock rights shall vest over a four (4) year period as follows: after 12 months of employment or service, as applicable, 25% shall vest; the remainder shall vest quarterly over the following 36 months (the terms set forth in (a) and (b) above, the "Vesting Terms").

(vii) Audit and Compensation Committees. The Company will maintain an Audit Committee of the Board of Directors and a Compensation Committee of the Board of Directors. All committees of the Board of Directors, including without limitation, the Audit and Compensation Committees, shall each include at least one (1) director appointed by LC.

(viii) Proprietary Information and Inventions Agreements. The Company shall cause each employee of the Company to enter into a Proprietary Information and Inventions Agreement in a form and substance satisfactory to the Board of Directors and each consultant of the Company shall have entered a consulting agreement containing similar terms regarding proprietary information and invention assignment as are set forth in the Proprietary Information and Inventions Assignment Agreement approved by the Board of Directors.

(ix) Real Property Holding Corporation. The Company shall operate in a manner such that it will not become a "United States real property holding corporation" as such term is defined in Section 897(c)(2) of the Internal Revenue Code of 1986, as amended (the "Code"), and the regulations thereunder.

(x) Small Business Stock. The Company covenants and agrees that so long as any of the Preferred Stock, or the Common Stock into which such Preferred Stock is converted, are held by an Investor (or a transferee of such Investor) in whose hands such Preferred Stock or Common Stock are eligible to qualify as Qualified Small Business Stock as defined in Section 1202(c) of the Code, it will use commercially reasonable efforts to (i) comply with any applicable filing or reporting requirements imposed by the Code on issuers of Qualified Small Business Stock; (ii) execute and deliver to each Investor, from time to time, such forms, documents, schedules and other instruments as may be reasonably requested thereby to cause such Preferred Stock, or the Common Stock into which they are converted, to qualify as Qualified Small Business Stock; and (iii) use reasonable best efforts to ensure (x) the Company continues to meet the requirements of a "qualified small business" as defined in Section 1202(d) of the Code and the Preferred Stock (or Common Stock into which such Preferred Shares are converted) qualify as Qualified Small Business Stock as defined in Section 1202(c) of the Code provided that clause (iii) shall not apply to any failure of the Preferred Stock (or Common Stock into which such Preferred Shares are converted) by reason of (A) Section 1202(c)(3)(A) of the Code or (B) any redemption described in Section 1202(c)(3)(B) of the Code if, in the case of sub-clause (B), the Investor holding any Qualified Small Business Stock participates in such redemption.

(xi) Good Faith. The Company will not, by any voluntary action, avoid or seek to avoid the observance or performance of any of the terms to be performed hereunder by the Company, but will at all times in good faith assist in the carrying out of all of the provisions

of this Agreement and in the taking of all such actions as may be necessary, appropriate in order to protect the rights of the parties hereunder against impairment.

(xii) Fees and Expenses. In connection with a Qualified Public Offering, the Company will reimburse up to $50,000 of expenses for one legal counsel representing the holders of Registrable Securities in connection therewith.

(b) Negative Covenants of the Company. Without limiting any other covenants and provisions hereof, the Company covenants and agrees that until the consummation of a Qualified Public Offering, so long as any shares of Preferred Stock are outstanding, it shall not take any of the following actions without the approval of the Board of Directors (including the affirmative consent of at least one (1) director appointed by LC), either directly or indirectly, by amendment, merger, consolidation, via a subsidiary or otherwise:

(i) Hire, fire or change the compensation of the CEO or the CSO;

(ii) Make any loans or advances to employees, except in the ordinary course of business as part of travel advances consistent with the Company's expenses and reimbursement policies;

(iii) Approve or make any material changes to the Company's business plan or annual budget;

(iv) License or transfer technology, other than in the ordinary course of business;

(v) Enter into any consulting, license, loan or lease agreements obligating the Company to make payments in excess of an aggregate of $250,000 per agreement in any calendar year; or

(vi) Agree to any of the foregoing.

(c) Reporting Requirements.

(i) Financial Statements and Notices of Certain Events. Until the earlier of (a) such time as the Company becomes subject to the reporting requirements of the Exchange Act, or (b) such time as no shares of Preferred Stock remain outstanding, the Company will furnish the following to each Major Investor:

(1) Monthly Reports: as soon as available and in any event within thirty (30) days after the end of each calendar month, unaudited financial statements of the Company and any subsidiaries as of the end of such month, including a consolidated (if applicable) balance sheet and statement of income and cash flows of the Company and any subsidiaries for such month and for the period commencing at the end of the previous fiscal year and ending with the end of such month, setting forth in each case in comparative form the corresponding figures for the corresponding period of the preceding fiscal year, and including comparisons to monthly budgets, cash flow analysis for such month, a schedule showing each expenditure of a capital nature during such month and the Company's current headcount, and a

summary discussion of the Company's principal and leading business indicators, all in reasonable detail and prepared in accordance with generally accepted accounting principles consistently applied (subject to year-end audit adjustments and the absence of footnotes);

(2) Quarterly Reports: as soon as available and in any event within forty-five (45) days after the end of each quarter of each fiscal year of the Company, unaudited financial statements of the Company and any subsidiaries as of the end of such quarter, including a consolidated (if applicable) balance sheet and statement of income and cash flows of the Company and any subsidiaries for such quarter and for the period commencing at the end of the previous fiscal year and ending with the end of such quarter, setting forth in each case in comparative form the corresponding figures for the corresponding period of the preceding fiscal year, and including comparisons to quarterly budgets, cash flow analysis for such quarter, a schedule showing each expenditure of a capital nature during such quarter and the Company's current headcount, a summary discussion of the Company's principal and leading business indicators, and a management report of the Company's principal functional areas summarizing the operations and business outlook of the Company, all in reasonable detail and prepared in accordance with generally accepted accounting principles consistently applied (subject to year-end audit adjustments and the absence of footnotes);

(3) Annual Reports: as soon as available and in any event within one hundred eighty (180) days after the end of each fiscal year of the Company, a copy of the annual audit report for such year for the Company and any subsidiaries, including therein a consolidated (if applicable) balance sheet of the Company and any subsidiaries as of the end of such fiscal year and a consolidated statement of income and cash flows of the Company and any subsidiaries for such fiscal year, setting forth in each case in comparative form the corresponding figures for the preceding fiscal year, all such consolidated statements to be duly certified by independent public accountants of recognized national standing approved by the Audit Committee;

(4) Notice of Adverse Changes: in each case, within ten (10) days of the CEO having actual knowledge of an occurrence, notice (which may be oral) of any material adverse change in the business, operations, affairs or condition (financial or otherwise) of the Company, of any material default under any material loan, lease or other material agreement to which the Company is a party, or of any material violation of applicable law by the Company;

(5) Written Reports: promptly after available and in any event within thirty (30) days after receipt, delivery or publication thereof, (a) any written reports submitted to the Company by independent public accountants in connection with an annual or interim audit of the books of the Company and any subsidiaries made by such accountants, including without limitation, each audit response letter and accountant management letter, (b) any material document (other than tax returns or patent or other intellectual property filings or applications) filed with a government department, commission, board, bureau, agency or instrumentality, domestic or foreign, including without limitation, the Environmental Protection Agency, the Internal Revenue Service or the Commission, and (c) regularly prepared written reports prepared by the Company to comply with any bank loan agreements;

(6) Notice of Proceedings: within five (5) Business Days after receipt of filing, notice (including copies of any publicly available pleadings) of all material actions, suits, litigations and proceedings pending or, to the knowledge of the Company, threatened against the Company, or, to the knowledge of the Company, against any officer, director, Key Employee or holder of more than 5% of the capital stock of the Company relating to such person's performance of duties for the Company or relating to his stock ownership in the Company, as applicable, including, without limiting their generality, actions pending or, to the knowledge of the Company, threatened involving the prior employment of any of the Company's officers or employees in their use in connection with the Company's business of any information or techniques allegedly proprietary to any of their former employers;

(7) Business Plan and Budget: as soon as available and in any event at least thirty (30) days prior to the end of each fiscal year (or such later date as is approved by the Board of Directors), a business plan and annual budget of the Company for the following fiscal year prepared on a monthly basis, including balance sheets, income statements and statements of cash flow for such months and, promptly after prepared, any other budgets or revised budgets prepared by the Company.

(d) Confidentiality. Each Investor agrees that it will, and will cause its employees, representatives and agents (including any observers) to, keep confidential and, except to the extent required by applicable law, not disclose or divulge any confidential, proprietary or secret information which such Investor may obtain from the Company pursuant to any rights granted hereunder and which is not generally available to the public unless such information is or becomes known to the Investor from a source other than the Company that is not known to such Investor to be under a confidentiality obligation with respect to such information, or is or becomes publicly known, or unless the Company gives its written consent to such Investor's release of such information, except that no such written consent shall be required (and the Investor shall be free to release such information to such recipient) if such information is to be provided to the Investor's counsel or accountant, or, with respect to non-technical information, including financial information, to an officer, director, employee, partner or member of such Investor or its Affiliates, provided that, in each case, the Investor shall inform the recipient of the confidential nature of such information, and shall obtain the recipient's agreement to treat the information as confidential. Nothing in this Section 13(d) shall be construed as a representation that an Investor or its Affiliates will not develop or acquire information that is the same as or similar to the Company's confidential information, provided that such party does not do so in breach of this Section 13(d).

(e) Successor Indemnification. If the Company or any of its successors or assignees consolidates with or merges into any other Person and is not the continuing or surviving corporation or entity of such consolidation or merger, then to the extent necessary, proper provision shall be made so that the successors and assignees of the Company assume the obligations of the Company with respect to indemnification of members of the Board of Directors as in effect immediately before such transaction, whether such obligations are contained in the Company's Bylaws, the Charter, or elsewhere, as the case may be.

14. Miscellaneous.

(a) All covenants and agreements contained in this Agreement by or on behalf of any of the parties hereto shall bind and inure to the benefit of the respective successors and permitted assigns of the parties hereto (including without limitation transferees of any Preferred Stock or Registrable Securities), whether so expressed or not, hereto; provided, however, that the rights and obligations of each Investor hereunder may only be assigned by such Investor to an Investor Affiliate or to a Person to which at least 100,000 shares of Registrable Securities (such minimum number of shares to be adjusted for any stock splits, stock dividends, recapitalizations or similar events) are transferred by such Investor; and provided, further, however, that the transferee provides written notice of such assignment to the Company and becomes a party to this Agreement by executing and delivering an instrument of accession in the form of Schedule II agreeing to be bound by and subject to the terms of this Agreement as an Investor hereunder. Each such Person shall thereafter be deemed an Investor for all purposes hereunder.

(b) In case any one or more of the provisions contained in this Agreement shall for any reason be held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provision of this Agreement and such invalid, illegal and unenforceable provision shall be reformed and construed so that it will be valid, legal, and enforceable to the maximum extent permitted by law.

(c) All notices and other communications required or permitted to be given pursuant to this Agreement shall be in writing signed by the sender, and shall be deemed duly given (i) on the date delivered if personally delivered, (ii) on the date sent by telecopier with automatic confirmation by the transmitting machine showing the proper number of pages were transmitted without error, (iii) on the Business Day after being sent by Federal Express or another recognized overnight mail service which utilizes a written form of receipt for next day or next Business Day delivery, (iv) two (2) Business Days after mailing, if mailed by United States postage-prepaid certified or registered mail, return receipt requested, or (v) one Business Day following the delivery of a duly transmitted electronic mail, in each case addressed to the applicable party at the address set forth below:

(1) if to the Company or any officer thereof, then at the Company's principal office addressed to the attention of the President and the Secretary, or to the attention of the specific officer, as the case may be, provided that for any notice provided to the Company or any officer of the Company hereunder, a copy (which shall not constitute notice) must also be sent to: Cooley LLP, 4401 Eastgate Mall, San Diego, CA 92121, Attention: Thomas A. Coll, Esq., Telecopier: (858) 550-6420, Telephone No.: (858) 550-6013; or

(2) if to any Investor, to such Investor's address as set forth on Schedule I or any Instrument of Accession hereto, as applicable;

or to such other address as any party hereto may advise the other parties in writing given in like manner.

(d) This Agreement and any and all matters arising directly or indirectly herefrom ("Agreement Matters") shall be governed by and construed and enforced in accordance with the internal laws of the State of Delaware applicable to agreements made and to be performed entirely in that state, without giving effect to the conflict of law principles of any

jurisdiction. Each of the parties hereto hereby (i) irrevocably consents and submits to the sole exclusive jurisdiction of the United States District Court for the District of Delaware and any state court in the State of Delaware (and of the appropriate appellate courts from any of the foregoing) in connection with any suit, arbitration, mediation, action or other proceeding (each a "Proceeding") directly or indirectly arising out of or relating to any Agreement Matter, provided that a party to this Agreement shall be entitled to enforce an order or judgment of such court in any United States or foreign court having jurisdiction over the other party hereto; (ii) irrevocably waives, to the fullest extent permitted by law, any objection that it may now or hereafter have to the laying of the venue of any such Proceeding in any such court or that any such Proceeding which is brought in any such court has been brought in an inconvenient forum; (iii) waives, to the fullest extent permitted by law, any immunity from jurisdiction of any such court or from any legal process therein; and (iv) agrees that service of any summons, complaint, notice or other process relating to such Proceeding may be effected in the manner provided for the giving of notice hereunder. EACH OF THE PARTIES HERETO HEREBY WAIVES ANY RIGHT IT MAY HAVE TO A TRIAL BY JURY IN RESPECT OF ANY CLAIM BASED UPON, ARISING OUT OF OR IN CONNECTION WITH ANY AGREEMENT MATTERS.

(e) This Agreement may not be amended or modified, and no provision hereof may be waived, without the written consent of (i) the Company and (ii) the Requisite Holders; provided, however, that notwithstanding the foregoing, any provision hereof may be waived by the benefiting party on behalf of itself, without the consent of any other party.

(f) This Agreement may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. This Agreement may be executed by facsimile signature(s) or other electronic means which shall be binding on the party delivering the same, to be followed by delivery of originally executed signature pages. Any amendment, termination or waiver effected in accordance with this Section 14(f) shall be binding on each party and all of such party's successors and permitted assigns, whether or not any such party, successor or assignee entered into or approved such amendment, termination or waiver. No delay or omission to exercise any right, power or remedy accruing to any party under this Agreement, upon any breach or default of any other party under this Agreement, shall impair any such right, power or remedy of such non-breaching or non-defaulting party nor shall it be construed to be a waiver of any such breach or default, or an acquiescence therein, or of any similar breach or default thereafter occurring; nor shall any waiver of any single breach or default be deemed a waiver of any other breach or default theretofore or thereafter occurring. Any waiver, permit, consent or approval of any kind or character on the part of any party of any breach or default under this Agreement, or any waiver on the part of any party of any provisions or conditions of this Agreement, must be in writing and shall be effective only to the extent specifically set forth in such writing. All remedies, either under this Agreement or by law or otherwise afforded to any party, shall be cumulative and not alternative.

(g) The headings contained in this Agreement are for reference purposes only and shall not in any way affect the meaning or interpretation of this Agreement.

(h) The obligations of the Company to register shares of Registrable Securities under Sections 4, 5 or 6 shall terminate as to any holder of Registrable Securities on

the earliest of (i) the fifth (5th) anniversary of the date of a Qualified Public Offering, (ii) the closing of a Deemed Liquidation Event, and (iii) such time following the consummation of a firm-commitment underwritten public offering of Common Stock pursuant to an effective registration statement filed under the Securities Act when all of the Registrable Securities could be sold without restriction under Rule 144 promulgated under the Securities Act in a 3-month period.

(i) Notwithstanding anything else contained herein to the contrary, the Company's obligation to file a registration statement, or cause such registration statement to become and remain effective, may be suspended for a period or periods not to exceed ninety (90) days in any 12-month period if in the Company's good faith judgment upon the advice of counsel it (i) would materially impede, delay, interfere with or otherwise or otherwise adversely affect any pending financing, registration of securities, acquisitions, corporate reorganization or other significant transaction involving the Company or (ii) it would require disclosure of non- public material information that the Company has a bona fide business purpose for preserving as confidential, and it is therefore essential to defer the filing of such registration statement.

(j) The Company will grant the holders of shares of Preferred Stock any pre-emptive rights or registration rights granted to subsequent purchasers of the Company's equity securities to the extent such pre-emptive rights or registration rights are superior, in good faith judgment of the Board of Directors, to those granted to the holders of shares of Preferred Stock hereunder. The Company shall not grant any "piggy-back" registration rights to any holders of shares of the Company that are superior, in good faith judgment of the Board of Directors, to those "piggy-back" registration rights of the holders of shares of Preferred Stock without the written consent of the Requisite Holders.

(k) In the event that after the date of this Agreement, the Company issues additional shares of Preferred Stock to any Person who is not already a party hereto, as a condition to the issuance of such shares the Company shall require that any purchaser of Preferred Stock become a party to this Agreement by executing and delivering an instrument of accession in the form of Schedule II agreeing to be bound by and subject to the terms of this Agreement as an Investor hereunder. Each such Person shall thereafter be deemed an Investor for all purposes hereunder.

(l) Notwithstanding anything set forth herein to the contrary, the joinder of any Person who is not already a party to this Agreement and executes an instrument of accession in substantially the form of Schedule II shall not be deemed an amendment to this Agreement.

(m) Notwithstanding anything to the contrary contained herein, if the Company issues additional shares of Series D-1 Preferred Stock after the date hereof pursuant to the Purchase Agreement, any purchaser of such shares of Series D-1 Preferred Stock may become a party to this Agreement by executing and delivering to the Company an additional counterpart signature page to this Agreement and thereafter shall be deemed a "Series D-1 Investor" for all purposes hereunder and Schedule I hereto shall be amended by the Company to add information regarding additional "Series D-1 Investors" and parties to this Agreement or to modify the information set forth therein.

(n) This Agreement constitutes the entire agreement among the parties with respect to the subject matter hereof and supersedes all prior and/or contemporaneous agreements and understandings, whether oral or written, between them or any of them as to such subject matter. This Agreement amends and restates in its entirety that certain BioNano Genomics, Inc. (formerly BioNanomatrix, Inc.) Fourth Amended and Restated Investors' Rights Agreement dated March 4, 2016, in accordance with Section 14(e) thereof.

[Remainder of Page Intentionally Left Blank]

Please indicate your acceptance of the foregoing by signing and returning the enclosed counterpart of this letter, whereupon this Agreement shall be a binding agreement between the Company and you.

Very truly yours,

THE COMPANY:

BIONANO GENOMICS, INC.

By: /s/ R. Erik Holmlin
Name: Erik Holmlin
Title: Chief Executive Officer

IN WITNESS WHEREOF, the undersigned have executed this Fifth Amended and Restated Investors' Rights Agreement as of the day and year first above written.

INVESTOR:

LC FUND VI, L.P.

By: /s/ Darren Cai, Ph.D.
Name: Darren Cai, Ph.D.
Title: Managing Director

IN WITNESS WHEREOF, the undersigned have executed this Fifth Amended and Restated Investors' Rights Agreement as of the day and year first above written.

INVESTOR:

LC PARALLEL FUND VI, L.P.

By: /s/ Darren Cai, Ph.D.
Name: Darren Cai, Ph.D.
Title: Managing Director

IN WITNESS WHEREOF, the undersigned have executed this Fifth Amended and Restated Investors' Rights Agreement as of the day and year first above written.

INVESTORS:

DOMAIN PARTNERS VIII, L.P.

By: One Palmer Square Associates VIII, L.L.C., its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

DP VIII ASSOCIATES, L.P.

By: One Palmer Square Associates VIII, L.L.C., its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

IN WITNESS WHEREOF, the undersigned have executed this Fifth Amended and Restated Investors' Rights Agreement as of the day and year first above written.

INVESTOR:

NOVARTIS BIOVENTURES LTD.

By: /s/ H.S. Zivi
Name: H.S. Zivi
Title: Chairman

By: /s/ Laurieann Chaikowsky
Name: Laurieann Chaikowsky
Title: Authorized Signatory

SCHEDULE I

BIONANO GENOMICS, INC.
9640 Towne Centre Drive, Suite 100
San Diego, CA 92121

SCHEDULE OF INVESTORS

SERIES A INVESTORS:

Battelle Memorial Institute

BVP GP, LLC

Innovation Valley Partners, LP

Ben Franklin Technology Partners
of Southeastern Pennsylvania

Steve Chazen

SERIES B INVESTORS:

Battelle Memorial Institute

BVP GP, LLC

Innovation Valley Partners, LP

Edward Ericson

Michael Kochersperger

Domain Partners VIII, L.P.

DP VIII Associates, L.P.

Steve Chazen

Gund Investment LLC

Han Cao

SERIES B-1 INVESTORS:

Battelle Memorial Institute

BVP GP, LLC

Innovation Valley Partners, LP

Domain Partners VIII, L.P.

DP VIII Associates, L.P.

Gund Investment LLC

Peter B. Dervan

Robert Austin

SERIES C INVESTORS:

LC Fund VI, L.P.

LC Parallel Fund VI, L.P.

Battelle Memorial Institute

BVP GP, LLC

Innovation Valley Partners, LP

Domain Partners VIII, L.P.

DP VIII Associates, L.P.

Gund Investment LLC

Robert Austin

Han Cao

Steve Chazen

Peter B. Dervan

Michael Kochersperger

Monashee Investment Management, LLC

Federated Kaufmann Fund

Federated Kaufmann Fund II

Shrewsbury Capital Partners LLC

NOVARTIS BIOVENTURES LTD.

with copies to:

Campbell Murray and Christine Brennan
Novartis Venture Fund

and

Albert L. Sokol, Partner
Edwards Wildman Palmer LLP

SERIES D INVESTORS:

LC Fund VI, L.P.

LC Parallel Fund VI, L.P.

Domain Partners VIII, L.P.

DP VIII Associates, L.P.

NOVARTIS BIOVENTURES LTD.

with copies to:

Campbell Murray and Christine Brennan
Novartis Venture Fund

and

Albert L. Sokol, Partner
Edwards Wildman Palmer LLP

Monashee Investment Management, LLC

BVP GP, LLC

Innovation Valley Partners, LP

Shrewsbury Capital Partners LLC

Robert Austin

Ben Franklin Technology Partners
of Southeastern Pennsylvania

Han Cao

Steve Chazen

Peter B. Dervan

Michael Kochersperger

SERIES D-1 INVESTORS:

LC Fund VI, L.P.

LC Parallel Fund VI, L.P.

LC Healthcare Fund I, L.P.

Praise Alliance International Limited

Alexandria Venture Investments, LLC

Full Succeed International Limited

Ascender Prosperity Capital Co., Ltd

AriMed International Ltd.

HybriBio Limited

Domain Partners VIII, L.P.

DP VIII Associates, L.P.

NOVARTIS BIOVENTURES LTD.

with copies to:

Campbell Murray and Christine Brennan
Novartis Venture Fund

and

Albert L. Sokol, Partner
Edwards Wildman Palmer LLP

Monashee Investment Management, LLC

Han Cao

BVP GP, LLC

Steve Chazen

Peter B. Dervan

Michael Kochersperger

Robert Austin

SCHEDULE II

BIONANO GENOMICS, INC.

INSTRUMENT OF ACCESSION

The undersigned, , as a condition precedent to becoming the owner or holder of record of ( ) shares of the Series Convertible Participating Preferred Stock, par value $0.0001 per share, of BioNano Genomics, Inc., a Delaware corporation and successor to BioNanomatrix, LLC (the "Company"), hereby agrees to become an Investor under that certain Fifth Amended and Restated Investors' Rights Agreement dated as of August 5, 2016 by and among the Company and certain stockholders of the Company, as amended to date (the "Investors' Rights Agreement"). This Instrument of Accession shall take effect and shall become an integral part of, and the undersigned shall become a party to and bound by, said Investors' Rights Agreement immediately upon execution and delivery to the Company of this Instrument.

IN WITNESS WHEREOF, this INSTRUMENT OF ACCESSION has been duly executed by or on behalf of the undersigned, as a sealed instrument under the laws of the State of Delaware, as of the date below written.

Signature:

_____

(Print Name) _____

Address:

_____

_____

Date: _____

Accepted:

BIONANO GENOMICS, INC.

By: _____
Name:
Title:

BIONANO GENOMICS, INC.

FIRST AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT

This **FIRST AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** (this "***Amendment***"), amending that certain Fifth Amended and Restated Investors' Rights Agreement by and among **BIONANO GENOMICS, INC.**, a Delaware corporation (the "***Company***"), and the persons and entities referenced therein (the "***Investors***") dated as of August 5, 2016 (the "***Investor Rights Agreement***"), is entered into as of July 16, 2018 by and among the Company and the Investors. Capitalized terms used herein which are not defined herein shall have the definition ascribed to them in the Investor Rights Agreement.

RECITALS

WHEREAS, the Company and the Investors have previously entered into the Investor Rights Agreement;

WHEREAS, Section 14(e) of the Investor Rights Agreement provides that the Investor Rights Agreement may be amended with the written consent of (i) the Company and (ii) the Requisite Holders (as defined therein); and

WHEREAS, the undersigned constitute the Company and the Requisite Investors.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing and the promises and covenants contained herein and in the Investor Rights Agreement, and for other good and valuable consideration, the receipt of which is hereby acknowledged, the parties hereto agree as follows:

1. The definition of "Qualified Public Offering" in Section 1 of the Investor Rights Agreement is hereby amended and restated in its entirety to read as follows:

"Qualified Public Offering" shall mean the closing of the sale of shares of Common Stock to the public (i) in which the price per share paid by the public (prior to the deduction of underwriting discounts and registration expenses) is no less than $6.00 per share (as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares after July 16, 2018) and (ii) resulting in at least $25,000,000 in gross proceeds to the Company (prior to the deduction of underwriting discounts and registration expenses), in a firm-commitment underwritten public offering pursuant to an effective registration statement under the Securities Act."

2. **Effect of Amendment**. Except as expressly modified by this Amendment, the Investor Rights Agreement shall remain unmodified and in full force and effect.

3. **Governing Law**. This Amendment shall be governed, construed and interpreted in accordance with the laws of the State of Delaware, without giving effect to the principles of conflict of laws.

4. **Counterparts**. This Amendment may be executed in any number of counterparts and signatures delivered by facsimile, each of which shall be deemed an original, but all of which together shall constitute one instrument.

[Remainder of this page intentionally left blank]

IN WITNESS WHEREOF, the parties hereto have executed this **FIRST AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

COMPANY:

BIONANO GENOMICS, INC.

By: /s/ Erik Holmlin
Name: Erik Holmlin
Title: Chief Executive Officer

IN WITNESS WHEREOF, the parties hereto have executed this **FIRST AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDER:

NOVARTIS BIOVENTURES LTD.

By: /s/ Bart Dzikowski
Name: Bart Dzikowski
Title: Secretary of the Board

IN WITNESS WHEREOF, the parties hereto have executed this **FIRST AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDERS:

LC FUND VI, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title:

LC PARALLEL FUND VI, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title:

LC HEALTHCARE FUND I, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title:

IN WITNESS WHEREOF, the parties hereto have executed this **FIRST AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDERS:

DOMAIN PARTNERS VIII, L.P.

By: One Palmer Square Associates VIII, L.L.C.,
its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

DP VIII ASSOCIATES, L.P.

By: One Palmer Square Associates VIII, L.L.C.,
its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

IN WITNESS WHEREOF, the parties hereto have executed this **FIRST AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDER:

MONASHEE INVESTMENT MANAGEMENT, LLC

By: /s/ Jeff Muller
Name: Jeff Muller
Title: CCO

IN WITNESS WHEREOF, the parties hereto have executed this **FIRST AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDER:

ALEXANDRIA VENTURE INVESTMENTS, LLC

By: Alexandria Real Estate Equities, Inc., its managing member

By: /s/ Aaron Jacobson
Name: Aaron Jacobson
Title: SVP – Venture Counsel

IN WITNESS WHEREOF, the parties hereto have executed this **FIRST AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDER:

FULL SUCCEED INTERNATIONAL LIMITED

By: /s/ Hainian Zeng
Name: Hainian Zeng
Title:

BIONANO GENOMICS, INC.

SECOND AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT

This **SECOND AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** (this "***Amendment***"), amending that certain Fifth Amended and Restated Investors' Rights Agreement by and among **BIONANO GENOMICS, INC.**, a Delaware corporation (the "***Company***"), and the persons and entities referenced therein (the "***Investors***") dated as of August 5, 2016 (the "***Investor Rights Agreement***"), is entered into as of July 31, 2018 by and among the Company and the Investors. Capitalized terms used herein which are not defined herein shall have the definition ascribed to them in the Investor Rights Agreement.

RECITALS

WHEREAS, the Company and the Investors have previously entered into the Investor Rights Agreement;

WHEREAS, Section 14(e) of the Investor Rights Agreement provides that the Investor Rights Agreement may be amended with the written consent of (i) the Company and (ii) the Requisite Holders (as defined therein); and

WHEREAS, the undersigned constitute the Company and the Requisite Investors.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing and the promises and covenants contained herein and in the Investor Rights Agreement, and for other good and valuable consideration, the receipt of which is hereby acknowledged, the parties hereto agree as follows:

1. The definition of "Qualified Public Offering" in Section 1 of the Investor Rights Agreement is hereby amended and restated in its entirety to read as follows:

> "Qualified Public Offering" shall mean the closing of the sale of shares of Common Stock to the public (i) in which the price per share paid by the public (prior to the deduction of underwriting discounts and registration expenses) is no less than $5.00 per share (as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares after July 16, 2018) and (ii) resulting in at least $25,000,000 in gross proceeds to the Company (prior to the deduction of underwriting discounts and registration expenses), in a firm-commitment underwritten public offering pursuant to an effective registration statement under the Securities Act."

2. **Effect of Amendment**. Except as expressly modified by this Amendment, the Investor Rights Agreement shall remain unmodified and in full force and effect.

3. **Governing Law**. This Amendment shall be governed, construed and interpreted in accordance with the laws of the State of Delaware, without giving effect to the principles of conflict of laws.

4. **Counterparts**. This Amendment may be executed in any number of counterparts and signatures delivered by facsimile, each of which shall be deemed an original, but all of which together shall constitute one instrument.

[Remainder of this page intentionally left blank]

IN WITNESS WHEREOF, the parties hereto have executed this **SECOND AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

COMPANY:

BIONANO GENOMICS, INC.

By: /s/ R. Erik Holmlin
Name: Erik Holmlin
Title: Chief Executive Officer

IN WITNESS WHEREOF, the parties hereto have executed this **SECOND AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDER:

NOVARTIS BIOVENTURES LTD.

By: /s/ Bart Dzikowski
Name: Bart Dzikowski
Title: Secretary of the Board

/s/ Anja König
Anja König
Authorized Signatory

IN WITNESS WHEREOF, the parties hereto have executed this **SECOND AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDERS:

LC FUND VI, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title:

LC PARALLEL FUND VI, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title:

LC HEALTHCARE FUND I, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title:

IN WITNESS WHEREOF, the parties hereto have executed this **SECOND AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDERS:

DOMAIN PARTNERS VIII, L.P.

By: One Palmer Square Associates VIII, L.L.C.,
its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

DP VIII ASSOCIATES, L.P.

By: One Palmer Square Associates VIII, L.L.C.,
its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

IN WITNESS WHEREOF, the parties hereto have executed this **SECOND AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDER:

MONASHEE INVESTMENT MANAGEMENT, LLC

By: /s/ Jeff Muller
Name: Jeff Muller
Title: CCO

IN WITNESS WHEREOF, the parties hereto have executed this **SECOND AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDER:

ALEXANDRIA VENTURE INVESTMENTS, LLC

By: /s/ Aaron Jacobson
Name: Aaron Jacobson
Title: SVP - Venture Counsel

BIONANO GENOMICS, INC.

THIRD AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT

This **THIRD AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** (this "***Amendment***"), amending that certain Fifth Amended and Restated Investors' Rights Agreement by and among **BIONANO GENOMICS, INC.**, a Delaware corporation (the "***Company***"), and the persons and entities referenced therein (the "***Investors***") dated as of August 5, 2016 (the "***Investor Rights Agreement***"), is entered into as of August 14, 2018 by and among the Company and the Investors. Capitalized terms used herein which are not defined herein shall have the definition ascribed to them in the Investor Rights Agreement.

RECITALS

WHEREAS, the Company and the Investors have previously entered into the Investor Rights Agreement;

WHEREAS, Section 14(e) of the Investor Rights Agreement provides that the Investor Rights Agreement may be amended with the written consent of (i) the Company and (ii) the Requisite Holders (as defined therein); and

WHEREAS, the undersigned constitute the Company and the Requisite Investors.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing and the promises and covenants contained herein and in the Investor Rights Agreement, and for other good and valuable consideration, the receipt of which is hereby acknowledged, the parties hereto agree as follows:

1. The definition of "Qualified Public Offering" in Section 1 of the Investor Rights Agreement is hereby amended and restated in its entirety to read as follows:

> "Qualified Public Offering" shall mean the closing of the sale to the public of either shares of Common Stock or units comprised of shares of Common Stock and warrants to purchase shares of Common Stock ("Units") (i) in which the price per share paid by the public (prior to the deduction of underwriting discounts and registration expenses) is no less than $6.00 per share, or to the extent Units are sold in such offering, no less than $6.00 per Unit (in each case as adjusted for any stock dividends, combinations, splits, recapitalizations and the like with respect to such shares after August 15, 2018), in each case in the initial closing of the such offering, and (ii) resulting in at least $15,000,000 in gross proceeds to the Company (prior to the deduction of underwriting discounts and registration expenses), in a firm-commitment underwritten public offering pursuant to an effective registration statement under the Securities Act."

2. **Effect of Amendment**. Except as expressly modified by this Amendment, the Investor Rights Agreement shall remain unmodified and in full force and effect.

3. **Governing Law**. This Amendment shall be governed, construed and interpreted in accordance with the laws of the State of Delaware, without giving effect to the principles of conflict of laws.

4. **Counterparts**. This Amendment may be executed in any number of counterparts and signatures delivered by facsimile, each of which shall be deemed an original, but all of which together shall constitute one instrument.

[Remainder of this page intentionally left blank]

IN WITNESS WHEREOF, the parties hereto have executed this **THIRD AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

COMPANY:

BIONANO GENOMICS, INC.

By: /s/ Erik Holmlin
Name: Erik Holmlin
Title: Chief Executive Officer

IN WITNESS WHEREOF, the parties hereto have executed this **THIRD AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDER:

NOVARTIS BIOVENTURES LTD.

By: /s/ Bart Dzikowski
Name: Bart Dzikowski
Title: Secretary of the Board

By: /s/ Florian Muellershausen
Name: Florian Muellershausen
Title: Authorized Signatory

IN WITNESS WHEREOF, the parties hereto have executed this **THIRD AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDERS:

LC FUND VI, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title:

LC PARALLEL FUND VI, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title:

LC HEALTHCARE FUND I, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title:

IN WITNESS WHEREOF, the parties hereto have executed this **THIRD AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDERS:

DOMAIN PARTNERS VIII, L.P.

By: One Palmer Square Associates VIII, L.L.C.,
its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

DP VIII ASSOCIATES, L.P.

By: One Palmer Square Associates VIII, L.L.C.,
its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

IN WITNESS WHEREOF, the parties hereto have executed this **THIRD AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDER:

ALEXANDRIA VENTURE INVESTMENTS, LLC

By: /s/ Gary Dean
Name: Gary Dean
Title: Senior Vice President RE Legal Affairs

IN WITNESS WHEREOF, the parties hereto have executed this **THIRD AMENDMENT TO FIFTH AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT** as of the date set forth in the first paragraph hereof.

HOLDER:

INNOVATION VALLEY PARTNERS

By: /s/ Sharon J Pryse
Name: Sharon J Pryse
Title: General Partner

BIONANO GENOMICS, INC.

2018 EQUITY INCENTIVE PLAN

ADOPTED BY THE BOARD OF DIRECTORS: AUGUST 14, 2018
APPROVED BY THE STOCKHOLDERS: AUGUST 14, 2018
IPO DATE: _____

1. GENERAL.

(a) Successor to and Continuation of Prior Plan. The Plan is intended as the successor to and continuation of the Bionano Genomics, Inc. Amended and Restated 2006 Equity Compensation Plan (the "***Prior Plan***"). From and after 12:01 a.m. Pacific Time on the IPO Date, no additional stock 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 stock 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 types of 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 granting 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 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 Committee may, at any time, abolish the subcommittee and/or revest in the Committee any powers delegated to the subcommittee. 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 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 1,499,454 shares (the "***Share Reserve***"), which number is the sum of (i) 1,000,000 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, 2028, 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 or reacquired by the Company for any reason, including 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 or reacquired 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 Share Reserve and 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 2,998,908 shares of Common Stock.

(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 a single 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 $500,000 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, $800,000.

(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 (10) 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 herein, 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 Regulation 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 three (3) months following the termination of the Participant's Continuous Service (or such longer or shorter period specified in the applicable Award Agreement, which period will not be less than thirty (30) days if necessary to comply with applicable laws unless such termination is for Cause) 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. Except as otherwise provided in the applicable Award Agreement or other written agreement between the Participant and the Company, 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 twelve (12) months following such termination of Continuous Service (or such longer or shorter period specified in the Award Agreement, which period will not be less than six (6) months if necessary to comply with applicable laws) 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 eighteen (18) months following the date of death (or such longer or shorter period specified in the Award Agreement, which period will not be less than six (6) months if necessary to comply with applicable laws) 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 or any Affiliate 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 (6) 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 (6) 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 deems appropriate. To the extent consistent with the Company's bylaws, at the Board's election, shares of Common Stock may be (i) held in book entry form subject to the Company's instructions until any restrictions relating to the Restricted Stock Award lapse; or (ii) 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 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 deems 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 or other written agreement between a Participant and the Company or an Affiliate, 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 the Committee 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 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 may specify, to be paid in whole or in part in cash or other property.

(iii) Board Discretion. The Board 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 Stock Awards.

(b) Securities Law Compliance. The Company will seek to obtain from each regulatory commission or agency having jurisdiction over the Plan, 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 securities 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 Stock 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 approving 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 Stock 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 Stock 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) 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 voluntary 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.

(l) 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" 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.

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) 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 maximum number of securities that may be issued pursuant to the exercise of Incentive Stock Options pursuant to Section 3(c), (iv) the class(es) and maximum number of securities that may be awarded to any Non-Employee Director pursuant to Section 3(d), and (v) 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 will 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 may 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 determines (or, if the Board does 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; *provided*, *however*, that the Board may require Participants to complete and deliver to the Company a notice of exercise before the effective date of a Transaction, which exercise is contingent upon the effectiveness of such 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 $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 the Company's Common Stock in connection with the Transaction is delayed as a result of escrows, earn outs, holdbacks or any 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, but in the absence of such provision, no such acceleration will automatically occur.

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 Share 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 laws 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 IPO Date, 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, (A) 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 (B) 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 Bionano Genomics, 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 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) sales; (ii) revenues; (iii) assets; (iv) expenses; (v) market penetration or expansion; (vi) earnings from operations; (vii) earnings before or after deduction for all or any portion of interest, taxes, depreciation, amortization, incentives, service fees or extraordinary or special items, whether or not on a continuing operations or an aggregate or per share basis; (viii) net income or net income per common share (basic or diluted); (ix) return on equity, investment, capital or

assets; (x) one or more operating ratios; (xi) borrowing levels, leverage ratios or credit rating; (xii) market share; (xiii) capital expenditures; (xiv) cash flow, free cash flow, cash flow return on investment, or net cash provided by operations; (xv) stock price, dividends or total stockholder return; (xvi) development of new technologies or products; (xvii) sales of particular products or services; (xviii) economic value created or added; (xix) operating margin or profit margin; (xx) customer acquisition or retention; (xxi) raising or refinancing of capital; (xxii) successful hiring of key individuals; (xxiii) resolution of significant litigation; (xxiv) acquisitions and divestitures (in whole or in part); (xxv) joint ventures and strategic alliances; (xxvi) spin-offs, split-ups and the like; (xxvii) reorganizations; (xxviii) recapitalizations, restructurings, financings (issuance of debt or equity) or refinancings; (xxix) or strategic business criteria, consisting of one or more objectives based on the following goals: achievement of timely development, design management or enrollment, meeting specified market penetration or value added, payor acceptance, patient adherence, peer reviewed publications, issuance of new patents, establishment of or securing of licenses to intellectual property, product development or introduction (including, without limitation, discovery of novel products, maintenance of multiple products in pipeline, product launch or other product development milestones), geographic business expansion, cost targets, cost reductions or savings, customer satisfaction, operating efficiency, acquisition or retention, employee satisfaction, information technology, corporate development (including, without limitation, licenses, innovation, research or establishment of third party collaborations), manufacturing or process development, legal compliance or risk reduction, patent application or issuance goals, or goals relating to acquisitions, divestitures or other business combinations (in whole or in part), joint ventures or strategic alliances; and (xxx) other measures of performance selected by the Board.

(ll) "***Performance Goals***" means, for a Performance Period, the one or more goals established by the Board 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. The Board is authorized at any time in its sole discretion, to adjust or modify the calculation of a Performance Goal for such Performance Period in order to prevent the dilution or enlargement of the rights of Participants, (a) in the event of, or in anticipation of, any unusual or extraordinary corporate item, transaction, event or development; (b) in recognition of, or in anticipation of, any other unusual or nonrecurring events affecting the Company, or the financial statements of the Company in response to, or in anticipation of, changes in applicable laws, regulations, accounting principles, or business conditions; or (c) in view of the Board's assessment of the business strategy of the Company, performance of comparable organizations, economic and business conditions, and any other circumstances deemed relevant. Specifically, the Board is authorized to make adjustment in the method of calculating attainment of Performance Goals and objectives for a Performance Period as follows: (i) to exclude the dilutive effects of acquisitions or joint ventures; (ii) 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; and (iii) 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. In addition, the Board is authorized to make adjustment in the method of calculating attainment of Performance Goals and objectives for a Performance Period as follows: (i) to exclude restructuring and/or other nonrecurring charges; (ii) to exclude exchange rate effects, as applicable, for non-U.S. dollar denominated net sales and operating earnings; (iii) to exclude the effects of changes to generally accepted accounting standards required by the Financial Accounting Standards Board; (iv) to exclude the effects of any items that are "unusual" in nature or occur "infrequently" as determined under generally accepted accounting principles; (v) to exclude the effects to any statutory adjustments to corporate tax rates; and (vi) to make other appropriate adjustments selected by the Board.

(mm) "***Performance Period***" means the period of time selected by the Board 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.

(nn) "***Performance Stock Award***" means a Stock Award granted under the terms and conditions of Section 6(c)(i).

(oo) "***Plan***" means this Bionano Genomics, Inc. 2018 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.

BIONANO GENOMICS, INC.

2018 EMPLOYEE STOCK PURCHASE PLAN

ADOPTED BY THE BOARD OF DIRECTORS: AUGUST 14, 2018
APPROVED BY THE STOCKHOLDERS: AUGUST 14, 2018

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 procedures and sub-plans as are necessary or appropriate to permit participation in the Plan by Employees who are foreign nationals or employed 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 to the Board in this Plan and in any applicable Offering Document 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 175,000 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 IPO Date and ending on (and including) January 1, 2028, 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) 220,000 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.

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 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.

(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 exceeds $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 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 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 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 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 specifically provided in the Offering, in addition to making Contributions by payroll deductions, a Participant may make Contributions through the payment by cash or check 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 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) 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 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, 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 and such remaining amount is less than the amount required to purchase one share of Common Stock on the final Purchase Date of an Offering, then such remaining amount will be held in such Participant's account for the purchase of shares of Common Stock under the next Offering under the Plan, unless such Participant withdraws from or is not eligible to participate in such next Offering, in which case such amount will be distributed to such Participant after the final Purchase Date without interest. If the amount of Contributions remaining in a Participant's account after the purchase of shares of Common Stock is at least equal to the amount required to purchase one (1) whole share of Common Stock on the final

Purchase Date of an Offering, then such remaining amount will be distributed in full to such Participant after the final Purchase Date of such Offering without interest.

(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 6 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, 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. 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 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 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 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.

Notwithstanding anything in the Plan or any Offering Document to the contrary, the Board will be entitled to: (i) establish the exchange ratio applicable to amounts withheld in a currency other than U.S. dollars; (ii) permit Contributions in excess of the amount designated by a Participant in order to adjust for mistakes in the Company's processing of properly completed Contribution elections; (iii) establish reasonable waiting and adjustment periods and/or accounting and crediting procedures to ensure that amounts applied toward the purchase of Common Stock for each Participant properly correspond with amounts withheld from the Participant's Contributions; (iv) amend any outstanding Purchase Rights or clarify any ambiguities regarding the terms of any Offering to enable the Purchase Rights to qualify under and/or comply with Section 423 of the Code; and (v) establish other limitations or procedures as the Board determines in its sole discretion advisable that are consistent with the Plan. The actions of the Board pursuant to this paragraph will not be considered to alter or impair any Purchase Rights granted under an Offering as they are part of the initial terms of each Offering and the Purchase Rights granted under each Offering.

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 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.

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.

(g) "***Company***" means Bionano Genomics, 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, 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 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 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 underwriter(s) 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 Bionano Genomics, Inc. 2018 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) "***Subsidiary***" means, with respect to the Company, (i) any corporation of which more than fifty percent (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 fifty percent (50%). For purposes of the foregoing clause (i), the Company will be deemed to "Own" or have "Owned" such securities if the Company, 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.

(bb) "***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.

OMNIBUS AMENDMENT TO CONVERTIBLE PROMISSORY NOTES

This **OMNIBUS AMENDMENT TO CONVERTIBLE PROMISSORY NOTES** (this ***"Amendment"***) is entered into effective as of August 14, 2018, by and among Bionano Genomics, Inc., a Delaware corporation (the ***"Company"***), and each of those persons and entities identified on the signature pages hereto as Lenders (each a ***"Lender"*** and collectively the ***"Lenders"***).

RECITALS

A. The Company and the Lenders are parties to that certain Note Purchase Agreement, dated as of February 9, 2018, by and among the Company and the persons and entities named on the Schedule of Investors attached thereto (the "***Investors***"), as previously amended on April 2, 2018 and June 29, 2018 (the "***Purchase Agreement***"), pursuant to which the Investors purchased certain subordinated convertible promissory notes at the First Closing (as defined therein) (the "***First Closing Notes***") and a certain subordinated convertible promissory note at the Midcap Closing (as defined therein) (the "***Midcap Closing Note***", and together with the First Closing Notes, the ***"Notes"***).

B. Each Note provides that any provision of the applicable Note may be amended or modified by the written consent of the Company and the Requisite Investors (as defined in the Purchase Agreement) and the Midcap Closing Note requires the consent of the holder thereof for certain amendments.

C. The Company and each of the undersigned Lenders desire to consent and agree to the amendment of each of the Notes as reflected herein.

AGREEMENT

In exchange for other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, the parties agree as follows:

1. Amendment to Notes.

(a) Section 5.2 of each of the First Closing Notes is hereby amended and restated in its entirety as follows:

Conversion at Initial Public Offering. If at any time prior to the Maturity Date the Company completes an initial public offering of its Common Stock or units comprised of shares of Common Stock and warrants to purchase shares of Common Stock ("***Units***") pursuant to an effective registration statement under the Securities Act of 1933, as amended (the "***IPO***"), if this Note has not been prepaid or converted prior to the closing of the IPO, then the Company shall provide to the Holder at least 10 days written notice prior to the closing of the IPO, and the Conversion Amount shall automatically convert into that number of shares of Common Stock as is equal to the quotient of (x) the Conversion Amount as of the

date immediately prior to the closing of the IPO divided by (y) 75% of the per share cash purchase price of the Common Stock to the public in the IPO or, to the extent Units are sold in the IPO, 75% of the per Unit cash purchase price of the Units to the public in the IPO.

(b) Section 5.2 of the Midcap Closing Notes is hereby amended and restated in its entirety as follows:

Conversion at Initial Public Offering. If at any time prior to the Maturity Date the Company completes an initial public offering of its Common Stock or units comprised of shares of Common Stock and warrants to purchase shares of Common Stock ("***Units***") pursuant to an effective registration statement under the Securities Act of 1933, as amended (the "***IPO***"), if this Note has not been prepaid or converted prior to the closing of the IPO, then the Company shall provide to the Holder at least 10 days written notice prior to the closing of the IPO, and the Conversion Amount shall automatically convert into that number of shares of Common Stock as is equal to the quotient of (x) the Conversion Amount as of the date immediately prior to the closing of the IPO divided by (y) 80% of the per share cash purchase price of the Common Stock to the public in the IPO or, to the extent Units are sold in the IPO, 80% of the per Unit cash purchase price of the Units to the public in the IPO.

2. Miscellaneous.

(a) This Amendment may be executed in any number of counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. Facsimile signatures shall be as effective as original signatures.

(b) Each undersigned Lender hereby covenants and agrees that following the effectiveness of this Amendment an original or copy of this Amendment shall at all times be affixed to each Note.

(c) This Amendment is to be construed in accordance with and governed by the internal laws of the State of California without giving effect to any choice of law rule that would cause the application of the laws of any jurisdiction other than the internal laws of the State of California to the rights and duties of the Company and the holders of the Notes.

(d) Except as set forth above, the Notes shall remain in full force and effect in accordance with their respective terms.

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IN WITNESS WHEREOF, the undersigned has executed this **OMNIBUS AMENDMENT TO CONVERTIBLE PROMISSORY NOTES** as of the date first written above.

BIONANO GENOMICS, INC.

By: /s/ Erik Holmlin
Name: Erik Holmlin
Title: Chief Executive Officer

IN WITNESS WHEREOF, the undersigned has executed this **OMNIBUS AMENDMENT TO CONVERTIBLE PROMISSORY NOTES** as of the date first written above.

LENDER:

LC Healthcare Fund I, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title: Managing Director

IN WITNESS WHEREOF, the undersigned has executed this **OMNIBUS AMENDMENT TO CONVERTIBLE PROMISSORY NOTES** as of the date first written above.

LENDER:

ROSY SHINE LIMITED

By: /s/ Hao Ouyang
Name: Hao Ouyang
Title: Director

IN WITNESS WHEREOF, the undersigned has executed this **OMNIBUS AMENDMENT TO CONVERTIBLE PROMISSORY NOTES** as of the date first written above.

LENDERS:

DOMAIN PARTNERS VIII, L.P.

By: One Palmer Square Associates VIII, L.L.C.,
its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

DP VIII ASSOCIATES, L.P.

By: One Palmer Square Associates VIII, L.L.C.,
its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

IN WITNESS WHEREOF, the undersigned has executed this **OMNIBUS AMENDMENT TO CONVERTIBLE PROMISSORY NOTES** as of the date first written above.

LENDER:

MIDCAP FUNDING XXVII TRUST

By: Apollo Capital Management, L.P.,
its investment manager

By: Apollo Capital Management GP,
LLC, its general partner

By: /s/ Maurice Amsellem
Name: Maurice Amsellem
Title: Authorized Signatory

BIONANO GENOMICS, INC.
OMNIBUS AMENDMENT TO SERIES B-1 WARRANTS

This **OMNIBUS AMENDMENT TO SERIES B-1 WARRANTS** (this ***"Amendment"***) is entered into effective as of August 14, 2018, by and among Bionano Genomics, Inc., a Delaware corporation (the ***"Company"***), and each of those persons and entities identified on the signature pages hereto as Holders (each a ***"Holder"*** and collectively the ***"Holders"***).

RECITALS

A. The Company and the Holders are parties to (i) that certain Series B-1 Convertible Participating Preferred Stock and Warrant Purchase Agreement dated June 20, 2012, by and among the Company and the Purchasers listed on Exhibit A thereto (the "***2012 Purchase Agreement***"); (ii) that certain Note and Warrant Purchase Agreement dated September 17, 2013, by and among the Company and the Purchasers listed on the schedule of purchasers attached thereto (the "***2013 Purchase Agreement***") and (iii) that certain Note and Warrant Purchase Agreement dated June 12, 2014, by and among the Company and the Purchasers listed on the schedule of purchasers attached thereto (the "***2014 Purchase Agreement***", and together with the 2012 Purchase Agreement and 2013 Purchase Agreement, the "***Purchase Agreements***"), pursuant to which the Holders were issued certain Warrants to Purchase Series B-1 Preferred Stock (the "***Warrants***").

B. Section 13 of the Warrants provides that any terms of the applicable Warrant may be amended or waived with the written consent of the Company and the Requisite Holders (as defined in the Purchase Agreements);

C. The Company and each of the undersigned Holders desire to consent and agree to the amendment of each of the Warrants.

AGREEMENT

In exchange for other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, the parties agree as follows:

1. Amendment to Warrants.

(a) Section 2.2 of the Warrants is hereby amended and restated in its entirety as follows:

> **Net Exercise**. Notwithstanding any provisions herein to the contrary, if the fair market value of one Exercise Share is greater than the Exercise Price (at the date of calculation as set forth below), in lieu of exercising this Warrant pursuant to Section 2.1, the Holder may elect to receive Exercise Shares equal to the value (as determined below) of this Warrant (or the portion thereof being cancelled pursuant to this Section 2.2) by surrender of this Warrant at the principal office of the Company together with the properly endorsed Notice of Exercise in which

event the Company shall issue to the Holder a number of Exercise Shares computed using the following formula:

$$X = \frac{Y\,(A-B)}{A}$$

Where X = the number of Exercise Shares to be issued to the Holder

Y = the number of Exercise Shares purchasable under the Warrant or, if only a portion of the Warrant is being exercised, that portion of the Warrant being cancelled pursuant to this Section 2.2 (at the date of such calculation)

A = the fair market value of one Exercise Share (at the date of such calculation)

B = Exercise Price (as adjusted to the date of such calculation)

For purposes of the above calculation, the fair market value of one Exercise Share shall be determined by the Company's Board of Directors in good faith; provided, however, that in the event that this Warrant is exercised pursuant to this Section 2.2 in connection with the closing of the sale to the public of either shares of Common Stock or units comprised of shares of Common Stock and warrants to purchase shares of Common Stock ("***Units***"), the fair market value per share shall be the product of (i) the per share offering price to the public of the Company's initial public offering, or to the extent Units are sold in such initial public offering, the per Unit offering price of the Company's initial public offering, in each case in the initial closing of the such offering, and (ii) the number of shares of Common Stock into which each Exercise Share is convertible at the time of such exercise.

2. Miscellaneous.

(a) This Amendment may be executed in any number of counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. Facsimile signatures shall be as effective as original signatures.

(b) Each undersigned Holder hereby covenants and agrees that following the effectiveness of this Amendment an original or copy of this Amendment shall at all times be affixed to each Note.

(c) This Amendment is to be construed in accordance with and governed by the internal laws of the State of Delaware without giving effect to any choice of law rule that would cause the application of the laws of any jurisdiction other than the internal laws of the State of Delaware to the rights and duties of the Company and the holders of the Warrants.

(d) Except as set forth above, the Warrants shall remain in full force and effect in accordance with their respective terms.

IN WITNESS WHEREOF, the parties have executed this **OMNIBUS AMENDMENT TO SERIES B-1 WARRANTS** effective as of the Effective Date.

COMPANY:

BIONANO GENOMICS, INC.

By: /s/ Erik Holmlin
Name: Erik Holmlin
Title: Chief Executive Officer

IN WITNESS WHEREOF, the parties have executed this **OMNIBUS AMENDMENT TO SERIES B-1 WARRANTS** effective as of the Effective Date.

HOLDER:

BATTELLE MEMORIAL INSTITUTE

By: /s/ Edward Grecco
Name: Edward Grecco
Title: Exec VP and CFO

IN WITNESS WHEREOF, the parties have executed this **OMNIBUS AMENDMENT TO SERIES B-1 WARRANTS** effective as of the Effective Date.

HOLDER:

DOMAIN PARTNERS VIII, L.P.

By: One Palmer Square Associates VIII, L.L.C., its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

DP VIII ASSOCIATES, L.P.

By: One Palmer Square Associates VIII, L.L.C., its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

BIONANO GENOMICS, INC.
OMNIBUS AMENDMENT TO SERIES D WARRANTS

This **OMNIBUS AMENDMENT TO SERIES D WARRANTS** (this ***"Amendment"***) is entered into effective as of August 14, 2018, by and among Bionano Genomics, Inc., a Delaware corporation (the ***"Company"***), and each of those persons and entities identified on the signature pages hereto as Holders (each a ***"Holder"*** and collectively the ***"Holders"***).

RECITALS

A. The Company and the Holders are parties to that certain Series D Convertible Participating Preferred Stock and Warrant Purchase Agreement dated March 4, 2016, by and among the Company and the Purchasers listed on Exhibit A-1 and Exhibit A-2 thereto (the "***Purchase Agreement***"), pursuant to which the Holders were issued certain Warrants to Purchase Series D Preferred Stock (the "***Warrants***").

B. Section 13 of the Warrants provides that any terms of the applicable Warrant may be amended or waived with the written consent of the Company and the Requisite Holders (as defined in the Purchase Agreement);

C. The Company and each of the undersigned Holders desire to consent and agree to the amendment of each of the Warrants.

AGREEMENT

In exchange for other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, the parties agree as follows:

1. Amendment to Warrants.

(a) Section 2.2 of the Warrants is hereby amended and restated in its entirety as follows:

> **Net Exercise**. Notwithstanding any provisions herein to the contrary, if the fair market value of one Exercise Share is greater than the Exercise Price (at the date of calculation as set forth below), in lieu of exercising this Warrant pursuant to Section 2.1, the Holder may elect to receive Exercise Shares equal to the value (as determined below) of this Warrant (or the portion thereof being cancelled pursuant to this Section 2.2) by surrender of this Warrant at the principal office of the Company together with the properly endorsed Notice of Exercise in which event the Company shall issue to the Holder a number of Exercise Shares computed using the following formula:
>
> $$X = \frac{Y\,(A-B)}{A}$$

Where X = the number of Exercise Shares to be issued to the Holder

Y = the number of Exercise Shares purchasable under the Warrant or, if only a portion of the Warrant is being exercised, that portion of the Warrant being cancelled pursuant to this Section 2.2 (at the date of such calculation)

A = the fair market value of one Exercise Share (at the date of such calculation)

B = Exercise Price (as adjusted to the date of such calculation)

For purposes of the above calculation, the fair market value of one Exercise Share shall be determined by the Company's Board of Directors in good faith; provided, however, that in the event that this Warrant is exercised pursuant to this Section 2.2 in connection with the closing of the sale to the public of either shares of Common Stock or units comprised of shares of Common Stock and warrants to purchase shares of Common Stock ("***Units***"), the fair market value per share shall be the product of (i) the per share offering price to the public of the Company's initial public offering, or to the extent Units are sold in such initial public offering, the per Unit offering price of the Company's initial public offering, in each case in the initial closing of the such offering, and (ii) the number of shares of Common Stock into which each Exercise Share is convertible at the time of such exercise.

2. Miscellaneous.

(a) This Amendment may be executed in any number of counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. Facsimile signatures shall be as effective as original signatures.

(b) Each undersigned Holder hereby covenants and agrees that following the effectiveness of this Amendment an original or copy of this Amendment shall at all times be affixed to each Note.

(c) This Amendment is to be construed in accordance with and governed by the internal laws of the State of Delaware without giving effect to any choice of law rule that would cause the application of the laws of any jurisdiction other than the internal laws of the State of Delaware to the rights and duties of the Company and the holders of the Warrants.

(d) Except as set forth above, the Warrants shall remain in full force and effect in accordance with their respective terms.

IN WITNESS WHEREOF, the parties have executed this **OMNIBUS AMENDMENT TO SERIES D WARRANTS** effective as of the Effective Date.

COMPANY:

BIONANO GENOMICS, INC.

By: /s/ Erik Holmlin
Name: Erik Holmlin
Title: Chief Executive Officer

IN WITNESS WHEREOF, the parties have executed this **OMNIBUS AMENDMENT TO SERIES D WARRANTS** effective as of the Effective Date.

HOLDER:

LC FUND VI, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title:

LC PARALLEL FUND VI, L.P.

By: /s/ Jafar Wang
Name: Jafar Wang
Title:

IN WITNESS WHEREOF, the parties have executed this **OMNIBUS AMENDMENT TO SERIES D WARRANTS** effective as of the Effective Date.

HOLDER:

DOMAIN PARTNERS VIII, L.P.

By: One Palmer Square Associates VIII, L.L.C.,
its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

DP VIII ASSOCIATES, L.P.

By: One Palmer Square Associates VIII, L.L.C.,
its General Partner

By: /s/ Lisa A. Kraeutler
Name: Lisa A. Kraeutler
Title: Attorney-in-fact

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the use in this Amendment No. 5 to Registration Statement No. 333-225970 on Form S-1 of our report dated May 11, 2018 (July 16, 2018 as to the effects of the reverse stock split and August 15, 2018 as to the effects of the second reverse stock split, both described in Note 12), relating to the consolidated financial statements of Bionano Genomics, Inc., appearing in the Prospectus, which is a part of such Registration Statement, and to the reference to us under the heading “Experts” in such Prospectus.

/s/ DELOITTE & TOUCHE LLP

San Diego, California
August 15, 2018