

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

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

**Bionano Genomics, Inc.**  
(Exact name of registrant as specified in its charter)

Delaware  
(State or Other Jurisdiction of  
Incorporation or Organization)

3826  
(Primary Standard Industrial  
Classification Code Number)  
Bionano Genomics, Inc.  
9540 Towne Centre Drive, Suite 100  
San Diego, California 92121  
(858) 888-7600

26-1756290  
(I.R.S. Employer  
Identification Number)

(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.  
9540 Towne Centre Drive, Suite 100  
San Diego, California 92121  
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(Name, address, including zip code, and telephone number, including area code, of agent for service)

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**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, smaller reporting company, or an emerging growth company.

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

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

CALCULATION OF REGISTRATION FEE

Title of each class of securities to be registered	Proposed Maximum Aggregate Offering Price <sup>(1)</sup>	Amount of Registration Fee <sup>(1)</sup>
Common Stock, par value \$0.0001 per share <sup>(2)(3)</sup>	\$ 15,005,250	
Pre-funded warrants to purchase shares of common stock and common stock issuable upon exercise thereof <sup>(2)(3)</sup>	\$ 15,005,250	
Warrants to purchase Common Stock and shares of Common Stock issuable upon exercise thereof <sup>(2)</sup>	\$ 15,005,250	
Total	\$ 30,010,500	\$ 3,896 <sup>(4)</sup>

(1) Estimated solely for the purpose of calculating the registration fee in accordance with Rule 457(o) under the Securities Act of 1933, as amended (the "Securities Act").

(2) Pursuant to Rule 416 under the Securities Act of 1933, as amended, the securities being registered hereunder include such indeterminate number of additional securities as may be issuable to prevent dilution resulting from stock splits, dividends or similar transactions.

(3) The proposed maximum aggregate offering price of the common stock proposed to be sold in the offering will be reduced on a dollar-for-dollar basis based on the aggregate offering price of the pre-funded warrants offered and sold in the offering (plus the aggregate exercise price of the common stock issuable upon exercise of the pre-funded warrants), and as such the proposed aggregate maximum offering price of the common stock and pre-funded warrants (including the common stock issuable upon exercise of the pre-funded warrants), if any, is \$15,005,250.

(4) Of this amount, 3,637 was previously paid.

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

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

SUBJECT TO COMPLETION, DATED OCTOBER 17, 2019

PROSPECTUS



**5,265,000 Shares of Common Stock  
Pre-Funded Warrants to Purchase Shares of Common Stock  
Warrants to Purchase up to 5,265,000 Shares of Common Stock**

We are offering 5,265,000 shares of our common stock and common warrants to purchase an aggregate of 5,265,000 shares of our common stock (and the shares of common stock that are issuable from time to time upon exercise of the warrants). We are also offering to certain purchasers whose purchase of shares of common stock in this offering would otherwise result in the purchaser, together with its affiliates and certain related parties, beneficially owning more than 4.99% (or, at the election of the purchaser, 9.99%) of our outstanding common stock immediately following the consummation of this offering, the opportunity to purchase, if any such purchaser so chooses, pre-funded warrants, in lieu of shares of common stock that would otherwise result in such purchaser’s beneficial ownership exceeding 4.99% (or, at the election of the purchaser, 9.99%) of our outstanding common stock. Each pre-funded warrant will be exercisable for one share of our common stock. The purchase price of each pre-funded warrant and the accompanying common warrant will be equal to the price at which a share of common stock and accompanying common warrant are sold to the public in this offering, minus \$0.001, and the exercise price of each pre-funded warrant will be \$0.001 per share. The pre-funded warrants will be immediately exercisable and may be exercised at any time until all of the pre-funded warrants are exercised in full. This offering also relates to the shares of common stock issuable upon exercise of any pre-funded warrants sold in this offering. Each share of common stock and pre-funded warrant is being sold together with a common warrant to purchase one share of our common stock, at an exercise price of \$ per share. For each pre-funded warrant we sell, the number of shares of common stock we are offering will be decreased on a one-for-one basis. Because we will issue a common warrant for each share of our common stock and for each pre-funded warrant to purchase one share of our common stock sold in this offering, the number of common warrants sold in this offering will not change as a result of a change in the mix of the shares of our common stock and pre-funded warrants sold. The common warrants will be exercisable immediately and will expire five years from the date of issuance. The shares of common stock and pre-funded warrants, and the accompanying common warrants, can only be purchased together in this offering but will be issued separately and will be immediately separable upon issuance. Our common stock is listed on The Nasdaq Capital Market under the symbol “BNGO”. The last reported sale price of our common stock on The Nasdaq Capital Market on October 16, 2019 was \$2.85 per share. The public offering price per share of common stock and accompanying common warrant and any pre-funded warrant and accompanying common warrant, as the case may be, will be determined by us at the time of pricing, may be at a discount to the current market price, and the recent market price used throughout this prospectus may not be indicative of the final offering price. There is no established public trading market for the pre-funded warrants or common warrants, and we do not expect a market to develop. In addition, we do not intend to apply for a listing of the pre-funded warrants or common warrants on any national securities exchange.

You should read this prospectus and any prospectus supplement, together with additional information described under the headings “Incorporation of Certain Information by Reference” and “Where You Can Find More Information,” carefully before you invest in any of our securities.

We are an “emerging growth company” as defined by the Jumpstart Our Business Startups Act of 2012, and as such, we have elected to comply with certain reduced public company reporting requirements for this prospectus and future filings.

Investing in our securities involves a high degree of risk. See “Risk Factors” beginning on page 7 of this prospectus as well as in the documents incorporated by reference.

	Per Share	Per Pre-Funded Warrant	Per Common Warrant	Total
Public offering price	\$	\$	\$	\$
Underwriting discounts and commissions <sup>(1)</sup>	\$	\$	\$	\$
Proceeds to us, before expenses	\$	\$	\$	\$

(1) See “Underwriting” for additional information regarding underwriting compensation.

The delivery of the shares of common stock and any pre-funded warrants and common warrants to purchasers is expected to be made on or about October , 2019.

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

Sole Book-Running Manager

**Oppenheimer & Co.**

Lead Manager

**Roth Capital Partners**

Co-Lead Manager

**Maxim Group LLC**

The date of this prospectus is , 2019

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We incorporate by reference important information into this prospectus. You may obtain the information incorporated by reference without charge by following the instructions under “Where You Can Find More Information.” You should carefully read this prospectus as well as additional information described under “Incorporation of Certain Information by Reference,” before deciding to invest in our common stock.

Neither we nor the underwriters have authorized anyone to provide you with additional information or information different from that contained in this prospectus filed with the Securities and Exchange Commission. We take no responsibility for, and can provide no assurance as to the reliability of, any other information that others may give you. The underwriters are offering to sell, and seeking offers to buy, our common stock only in jurisdictions where offers and sales are permitted. The information contained in this prospectus is accurate only as of the date of this prospectus, regardless of the time of delivery of this prospectus or any sale of shares of our common stock. Our business, financial condition, results of operations and prospects may have changed since that date.

For investors outside the United States: We and the underwriters have not done anything that would permit this offering or the possession or distribution of this prospectus in any jurisdiction where action for those purposes is required, other than in the United States. Persons outside the United States who come into possession of this prospectus must inform themselves about, and observe any restrictions relating to, the offering of the shares of common stock and the distribution of this prospectus outside of the United States.

## PROSPECTUS SUMMARY

*The following summary highlights information contained or incorporated by reference elsewhere in this prospectus and does not contain all of the information that you should consider in making your investment decision. Before investing in our common stock, you should carefully read this entire prospectus, including our financial statements and the related notes and other documents incorporated by reference in this prospectus, as well as the information under the caption “Risk Factors” herein and under similar headings in the other documents that are incorporated by reference into this prospectus.*

*Except as otherwise indicated herein or as the context otherwise requires, references in this prospectus to “Bionano,” “the company,” “we,” “us” and “our” refer to Bionano Genomics, Inc.*

### Company 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 several hundred 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 exists that could more comprehensively and cost and time-efficiently detect structural variation.

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-intensive, with a modern solution designed to simplify workflow and reduces cost 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 seeking 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 120 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 Hospital of Philadelphia, Children’s National Health System, Columbia University, 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, Radboud University Medical Center and Salk Institute for Biological Studies. Our revenues in 2017 were \$9.5 million, representing approximately 40% growth over the prior year, and for 2018 our revenues were \$12 million representing approximately 26% growth over the prior year comparable period.

Approximately 7,000 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 is designed to give 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 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).

More than 30 medical institutions are conducting more than 20 human translational research and human clinical studies in 2019 and 2020 to assess Saphyr's ability to detect structural variations and diagnose patients and, in certain studies, to compare those results to those produced via existing cytogenetic methods. We expect the findings from these studies, whether assessed internally or published by the institution, to help drive adoption of Saphyr beginning in 2020.

Saphyr and its predecessor system, which we collectively refer to as our system in this prospectus, have been cited by researchers and clinicians in hundreds of 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 sequencing or cytogenetic technology. Saphyr enables these diagnostic calls with low cost per patient, high speed and industry leading performance. Saphyr's performance characteristics include up to 99% sensitivity, less than 2% false positive rates and accurate diagnosis with allele fraction, or the percentage of sample exhibiting the variant, as low as between 3-5%.

### **Recent Highlights**

Below is a summary of selected highlights since our initial public offering in August 2018:

- We announced the release of data sets by Columbia University, MD Anderson Cancer Center and other institutions affirming Saphyr as a replacement of current cytogenetic technologies for the detection of blood cancers.
- We announced the release of data from Radboud University Medical Center and other institutions showcasing the advantages of Saphyr over traditional cytogenetics for cancer and genetic disease detection.
- We announced the publication by the Human Genome Structural Variation Consortium of study results establishing Saphyr as being essential for comprehensive structural variation detection.
- We announced the publication by Berry Genomics and other institutions of study results showing highly accurate detection of facioscapulohumeral muscular dystrophy (FSHD) by Saphyr.
- We supported GrandOmics in its launch of a Saphyr-based genetic test for FSHD in China.
- As of September 2019, we have been cited in more than 500 publications.
- We sold our 80<sup>th</sup> Saphyr instrument.
- We announced the appointment of Dr. Kristina Vuori, MD, PhD to our Board of Directors.
- We launched new Saphyr hardware, consumables and software, increasing cost-effectiveness, speed and ease of use (\$300 per human sample; 6 human samples per day; 80-90% sensitivity with allele fraction between 3-5%).
- We announced the adoption of our Saphyr system by PerkinElmer Genomics and the University of Iowa, including their development of assays using our optical mapping technology to expand their genetic tests assessing disease-associated chromosomal abnormalities.

### **Other Recent Updates**

#### *Revenue Expectations*

While we have not finalized our full financial results for the quarter ended September 30, 2019, we expect to report that our total revenue for the three months ended September 30, 2019 was \$3.3 million, compared to \$2.8 million for the same period in 2018. This amount is preliminary, has not been audited and is subject to change in connection with the completion of our financial statements for the quarter ended September 30, 2019. In addition, our independent registered public accounting firm does not express an opinion or any other form of assurance with respect thereto. Accordingly, you should not place undue reliance on this information. Additional information and disclosures would be required for a more complete understanding of our financial position and results of operations as of September 30, 2019.

#### *Loan Agreement Waivers*

On October 16, 2019, we obtained a waiver, or the Waiver, from Innovatus Life Sciences Lending Fund I, LP, a Delaware limited partnership, or Innovatus, with respect to certain financial covenants under our Loan and Security

Agreement, or the Loan Agreement, dated March 14, 2019, by and among us, Innovatus, as collateral agent, and the lenders listed on Schedule 1.1 thereto, including East West Bank.

Under the Loan Agreement, we are required to meet certain minimum revenue targets measured at the end of each calendar quarter, or the Revenue Covenant. For the quarter ended September 30, 2019, we did not achieve the Revenue Covenant. The Waiver permits us to cure our non-compliance with the Revenue Covenant, so long as we (i) raise at least \$10,000,000 from the sale and issuance of securities in an underwritten public offering, or the Equity Raise, between October 16, 2019 and October 31, 2019, or the Specified Period, and (ii) amend, no later than five days after the end of the Specified Period, that certain Warrant to Purchase Common Stock issued to Innovatus on March 22, 2019, or the Bank Warrant, to decrease the exercise price per share of our common stock subject to the Bank Warrant from \$4.63 per share to \$0.48 per share.

In addition, under the Loan Agreement we are required to maintain a minimum cash balance in our collateral account with Innovatus, or the Liquidity Covenant. In the event that we are in non-compliance with the Liquidity Covenant during the Specified Period, Innovatus has agreed to waive such non-compliance, so long as (i) we pay a fee, or the Waiver Fee, on November 1, 2019, in the form of (1) the issuance by us of 572,917 shares of our common stock if the closing of the Equity Raise occurs before November 1, 2019, or (2) \$250,000 in cash if the Equity Raise does not close before November 1, 2019, and (ii) if the Waiver Fee is paid in shares of our common stock, within five days after the end of the Specified Period, we amend the Registration Rights Agreement by and among Innovatus, Innovatus Life Sciences Offshore Fund I, LP, and us, dated as of March 14, 2019, to include such shares of common stock as Registrable Securities as defined in such agreement.

We expect to comply with the terms of the Waiver, such that our non-compliance with the Revenue Covenant and potential non-compliance with the Liquidity Covenant, shall be deemed cured and no event of default under the Loan Agreement shall have occurred.

### **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 9540 Towne Centre Drive, Suite 100, San Diego, California 92121, and our telephone number is (858) 888-7600. Our website address is [www.bionanogenomics.com](http://www.bionanogenomics.com) and we regularly post copies of our press releases as well as additional information about us on our website.

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.

The trademarks, trade names and service marks appearing in this prospectus are the property of their respective owners. We do not intend our use or display of other companies' trademarks, trade names or service marks to imply a relationship with, or endorsement or sponsorship of us by, any other companies or products.

### **Implications of Being an Emerging Growth Company**

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 can remain an emerging growth company until the earlier of (1) the last day of the fiscal year (a) ending December 31, 2023, which is the end of the fiscal year following the fifth anniversary of the closing of our initial public offering, (b) in which we have total annual gross revenue of at least \$1.07 billion, or (c) in which we are deemed to be a large accelerated filer, which means the market value of our common stock that is held by non-affiliates exceeds \$700 million as of the prior June 30th, and (2) the date on which we have issued more than \$1.0 billion in non-convertible debt during the prior three-year period. 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 reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements. Additionally, even if we no longer qualify as an emerging growth company, as long as we are neither a “large accelerated filer” nor an “accelerated filer,” we would not be required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act.

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.

Finally, we are a “smaller reporting company” (and may continue to qualify as such even after we no longer qualify as an emerging growth company) and accordingly may provide less public disclosure than larger public companies, including the inclusion of only two years of audited financial statements and only two years of related selected financial data and management’s discussion and analysis of financial condition and results of operations disclosure. As a result, the information that we provide to our stockholders may be different than you might receive from other public reporting companies in which you hold equity interests.



**THE OFFERING**

**Common stock to be offered**

5,265,000 shares, assuming the sale of our common stock at an assumed public offering price of \$2.85 per share, which is the last reported sale price of our common stock on October 16, 2019, and no sale of any pre-funded warrants.

**Pre-funded warrants offered by us**

We are also offering to certain purchasers whose purchase of shares of common stock in this offering would otherwise result in the purchaser, together with its affiliates and certain related parties, beneficially owning more than 4.99% (or, at the election of the purchaser, 9.99%) of our outstanding common stock immediately following the consummation of this offering, the opportunity to purchase, if such purchasers so choose, pre-funded warrants, in lieu of shares of common stock that would otherwise result in any such purchaser's beneficial ownership exceeding 4.99% (or, at the election of the purchaser, 9.99%) of our outstanding common stock. Each pre-funded warrant will be exercisable for one share of our common stock. The purchase price of each pre-funded warrant and the accompanying common warrant will equal the price at which the share of common stock and the accompanying common warrant are being sold to the public in this offering, minus \$0.001, and the exercise price of each pre-funded warrant will be \$0.001 per share. The pre-funded warrants will be exercisable immediately and may be exercised at any time until all of the pre-funded warrants are exercised in full. This offering also relates to the shares of common stock issuable upon exercise of any pre-funded warrants sold in this offering. For each pre-funded warrant we sell, the number of shares of common stock we are offering will be decreased on a one-for-one basis. Because we will issue a common warrant for each share of our common stock and for each pre-funded warrant to purchase one share of our common stock sold in this offering, the number of common warrants sold in this offering will not change as a result of a change in the mix of the shares of our common stock and pre-funded warrants sold.

**Common Warrants offered by us**

Common warrants to purchase an aggregate of 5,265,000 shares of our common stock. Each share of our common stock and each pre-funded warrant to purchase one share of our common stock is being sold together with a common warrant to purchase one share of our common stock. Each common warrant will have an exercise price of \$ per share, will be immediately exercisable and will expire on the fifth anniversary of the original issuance date. The shares of common stock and pre-funded warrants, and the accompanying common warrants, as the case may be, can only be purchased together in this offering but will be issued separately and will be immediately separable upon issuance. This prospectus also relates to the offering of the shares of common stock issuable upon exercise of the common warrants.

**Common stock to be outstanding after this offering**

16,162,522 shares (assuming none of the warrants issued in this offering are exercised and assuming the sale of our common stock at an assumed public offering price of \$2.85 per share, which is the last reported sale price of our common stock on October 16, 2019, and no sale of any pre-funded warrants).

**Use of proceeds**

We estimate that the net proceeds from this offering will be approximately \$13.6 million based on an assumed offering price of



	<p>\$2.85 per share and accompanying warrant, which was the last reported sales price of our common stock on The Nasdaq Capital Market on October 16, 2019, and assuming no sale of any pre-funded warrants, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.</p> <p>We intend to use the net proceeds from this offering primarily for general corporate purposes, including working capital, sales and marketing activities, general and administrative matters and capital expenditures. These expectations are subject to change. See “Use of Proceeds” for additional information.</p>
<b>Risk factors</b>	<p>An investment in our securities involves a high degree of risk. See “Risk Factors” and the other information included in this prospectus and incorporated by reference herein for a discussion of factors you should carefully consider before deciding to invest in our securities stock.</p>
<b>National Securities Exchange Listing</b>	<p>Our common stock is listed on the Nasdaq Capital Market under the symbol “BNGO.” We do not intend to list the pre-funded warrants or common warrants on any securities exchange or nationally recognized trading system.</p>
	<p>The number of shares of our common stock that will be outstanding after this offering is based on 10,897,522 shares of common stock outstanding as of June 30, 2019, and assumes the sale and issuance by us of 5,265,000 shares of common stock (and no sale of any pre-funded warrants) in this offering and excludes:</p> <ul style="list-style-type: none"><li>• 1,716,719 shares of common stock issuable upon the exercise of options outstanding as of June 30, 2019 at a weighted average exercise price of \$5.99 per share;</li><li>• 223,540 shares of common stock reserved for future issuance under our 2018 Equity Incentive Plan as of June 30, 2019;</li><li>• 209,395 shares of common stock reserved for future issuance under our 2018 Employee Stock Purchase Plan as of June 30, 2019;</li><li>• 4,224,494 shares of common stock issuable upon the exercise of warrants outstanding as of June 30, 2019 at a weighted-average exercise price of \$6.125 per share; and</li><li>• 5,265,000 shares of common stock issuable upon the exercise of the common warrants issued in this offering.</li></ul> <p>Unless otherwise indicated, this prospectus reflects and assumes no issuances or exercises of any other outstanding options or warrants after June 30, 2019.</p>

## RISK FACTORS

*Investing in our common stock involves a high degree of risk. You should consider carefully the following risks and uncertainties as well as the risks and uncertainties described in the section entitled “Risk Factors” contained in our Annual Report on Form 10-K for the year ended December 31, 2018, as filed with the Securities and Exchange Commission, or SEC, on March 14, 2019, as well as in our subsequent Quarterly and Annual Reports filed with the SEC, which descriptions are incorporated in this prospectus by reference in their entirety, as well as in any prospectus supplement hereto. These risks and uncertainties are not the only risks and uncertainties we face. Additional risks and uncertainties not currently known to us, or that we currently view as immaterial, may also impair our business. If any of the risks or uncertainties described in our SEC filings or any additional risks and uncertainties actually occur, our business, financial condition, results of operations and cash flow could be materially and adversely affected. In that case, the trading price of our common stock could decline and you might lose all or part of your investment. You should carefully consider the following information about risks, together with the other information contained in this prospectus, before making an investment in our common stock.*

***If you purchase shares of common stock in this offering, you will experience immediate and substantial dilution in your investment. You will experience further dilution if we issue additional equity or equity-linked securities in the future.***

Since the price per share of our common stock being offered is substantially higher than the net tangible book value per share of our common stock, you will suffer immediate and substantial dilution with respect to the net tangible book value of the common stock you purchase in this offering. Based on the assumed combined public offering price of \$2.85 per share of common stock and accompanying warrants being sold in this offering, and our net tangible book value as of June 30, 2019, if you purchase shares of common stock in this offering, you will suffer immediate and substantial dilution of \$2.09 per share with respect to the net tangible book value of the common stock. See the section entitled “Dilution” for a more detailed discussion of the dilution you will incur if you purchase common stock in this offering.

If we issue additional shares of common stock, or securities convertible into or exchangeable or exercisable for shares of common stock, our stockholders, including investors who purchase shares of common stock and accompanying warrants in this offering, will experience additional dilution, and any such issuances may result in downward pressure on the price of our common stock. We also cannot assure you that we will be able to sell shares or other securities in any other offering at a price per share that is equal to or greater than the price per share paid by investors in this offering, and investors purchasing shares or other securities in the future could have rights superior to existing stockholders.

***Future sales of substantial amounts of our common stock, or the possibility that such sales could occur, could adversely affect the market price of our common stock.***

Future sales in the public market of shares of our common stock, including shares referred to in the foregoing risk factor or shares issued upon exercise of our outstanding stock options, or the perception by the market that these sales could occur, could lower the market price of our common stock or make it difficult for us to raise additional capital.

***There is no public market for the pre-funded warrants or common warrants being offered in this offering.***

There is no established public trading market for the pre-funded warrants or common warrants being offered in this offering, and we do not expect a market to develop. In addition, we do not intend to apply to list the pre-funded warrants or common warrants on any securities exchange or nationally recognized trading system, including the Nasdaq Capital Market. Without an active market, the liquidity of the pre-funded warrants or common warrants will be limited.

***Holders of pre-funded warrants or common warrants purchased in this offering will have no rights as common stockholders until such holders exercise such warrants and acquire our common stock.***

Until holders of pre-funded warrants or common warrants acquire shares of our common stock upon exercise of such warrants, holders of pre-funded warrants or common warrants will have no rights with respect to the shares of our common stock underlying such warrants. Upon exercise of the pre-funded warrants or common warrants, the holders will be entitled to exercise the rights of a common stockholder only as to matters for which the record date occurs after the exercise date.

***We will have broad discretion in the use of our existing cash and cash equivalents, including the proceeds from this offering, and may invest or spend our cash in ways with which you do not agree and in ways that may not increase the value of your investment.***

We will have broad discretion over the use of our cash and cash equivalents, including the proceeds from this offering. You may not agree with our decisions, and our use of cash may not yield any return on 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 failure to apply the net proceeds from this offering effectively could compromise our ability to pursue our growth strategy and we might not be able to yield a significant return, if any, on our investment of these net proceeds. You will not have the opportunity to influence our decisions on how to use our net proceeds from this offering.

***An active trading market for our common stock may not be sustained.***

Our shares of common stock began trading on The Nasdaq Capital Market on September 21, 2018. Given the limited trading history of our common stock, there is a risk that an active trading market for our shares will not be sustained, which could put downward pressure on the market price of our common stock and thereby affect the ability of our stockholders to sell their shares.

***If we are not able to comply with the applicable continued listing requirements or standards of the Nasdaq Capital Market, Nasdaq could delist our common stock.***

Our ability to publicly or privately sell equity securities and the liquidity of our common stock could be adversely affected if we are delisted from the Nasdaq Capital Market or if we are unable to transfer our listing to another stock market. Our common stock is currently listed on The Nasdaq Capital Market. In order to maintain this listing, we must satisfy minimum financial and other continued listing requirements and standards, including a requirement to maintain a minimum of \$2.5 million in stockholder equity.

For example, in a letter dated August 16, 2019, or the Notice, we were notified by The Nasdaq Stock Market LLC, or Nasdaq, that we failed to comply with Listing Rule 5550(b)(1) for continued listing on the Nasdaq Capital Market because our stockholder's equity, as reported in our Quarterly Report on Form 10-Q for the period ended June 30, 2019, is below the required minimum of \$2.5 million. The Notice also indicated that, as of August 13, 2019, we do not meet the alternative compliance standards relating to the market value of listed securities of \$35 million or net income from continuing operations of \$500,000 in the most recently completed fiscal year or in two of the last three most recently completed fiscal years, and therefore could be subject to delisting if we did not submit a plan to regain compliance within 45 calendar days of August 16, 2019.

In September 2019, we submitted a plan to Nasdaq to regain compliance. On October 16, 2019, Nasdaq granted us until February 12, 2020 to provide evidence of compliance with Listing Rule 5550(b), subject to certain requirements, including that we complete this offering by October 31, 2019, periodically update Nasdaq regarding any additional proceeds received from the sale of shares of our capital stock pursuant to our March 2019 common stock purchase agreement with Aspire Capital Fund, LLC, and publicly disclose evidence of our compliance with Listing Rule 5550(b). However, there can be no assurance that our plan will be accepted or that if it is, we will be able to regain compliance. If our plan to regain compliance with the minimum stockholders' equity standard is not accepted or if it is accepted but we do not regain compliance by the end of the extension period granted by Nasdaq, or if we fail to satisfy another Nasdaq requirement for continued listing, Nasdaq staff could provide notice that our common stock will become subject to delisting. In such event, Nasdaq rules permit us to appeal the decision to reject our proposed compliance plan or any delisting determination to a Nasdaq Hearings Panel. Accordingly, there can be no guarantee that we will be able to maintain our Nasdaq listing. Furthermore, the proceeds we raise in this offering may not be sufficient to allow us to regain compliance with continued listing on Nasdaq.

If our common stock is delisted by Nasdaq, it could lead to a number of negative implications, including an adverse effect on the price of our common stock, increased volatility in our common stock, reduced liquidity in our common stock, the loss of federal preemption of state securities laws and greater difficulty in obtaining financing. In addition, delisting of our common stock could deter broker-dealers from making a market in or otherwise seeking or generating interest in our common stock, could result in a loss of current or future coverage by certain sell-side analysts and might deter certain institutions and persons from investing in our securities at all. Delisting could also cause a loss of confidence of our customers, collaborators, vendors, suppliers and employees, which could harm our business and future prospects.

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If our common stock is delisted by Nasdaq, our common stock may be eligible to trade on the OTC Bulletin Board, OTC-QB or another over-the-counter market. Any such alternative would likely result in it being more difficult for us to raise additional capital through the public or private sale of equity securities and for investors to dispose of or obtain accurate quotations as to the market value of, our common stock. In addition, there can be no assurance that our common stock would be eligible for trading on any such alternative exchange or markets. Moreover, if our common stock is delisted, it may come within the definition of “penny stock” under the Exchange Act, which imposes additional sales practice requirements on broker-dealers who sell securities to persons other than established customers and accredited investors. For example, we and/or broker-dealers are required to make a special suitability determination for purchases of such securities and must receive a purchaser’s written consent to the transaction prior to any purchase. Additionally, unless exempt, prior to a transaction involving a penny stock, the penny stock rules require the delivery of a disclosure schedule prescribed by the SEC relating to the penny stock market. The broker-dealer must also disclose the commissions payable to the broker-dealer, current quotations for the securities and, if the broker-dealer is the sole market-maker for the security, the fact that they are the sole market-maker and their presumed control over the market. Finally, monthly statements disclosing recent price information on the limited market in penny stocks must be sent to holders of such penny stocks. These requirements may reduce trading activity in the secondary market for our common stock and may impact the ability or willingness of broker-dealers to sell our securities which could limit the ability of stockholders to sell their securities in the public market and limit our ability to attract and retain qualified employees or raise additional capital in the future.

***The terms of our debt 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 debt 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.***

Under the Loan Agreement, we may borrow up to \$25.0 million pursuant to certain term loans and an additional \$5.0 million through a revolving credit line. As of September 30, 2019, we have borrowed approximately \$20.3 million in term loans and \$1.0 million under the revolving credit line pursuant to the Loan Agreement.

The outstanding principal balance under the Loan Agreement is secured by a lien covering substantially all of our assets, including our intellectual property. The Loan Agreement 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. The Loan Agreement also includes standard events of default, including a provision that Innovatus 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 Agreement or upon the collateral or the liens on the collateral under the agreement, thereby requiring us to repay the loan immediately, together with a prepayment fee and other applicable fees.

In connection with the audit of our 2018 financial statements, the report of our independent registered public accounting firm expressed an unqualified opinion and included an explanatory paragraph relating to substantial doubt about our ability to continue as a going concern. In the future, Innovatus may determine that the underlying circumstances resulting in the receipt of a going concern explanatory paragraph in the auditor opinion for our 2018 financial statements either on their own, or together with contemporaneous events or circumstances, such as a failure to timely secure additional funding, constitute 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 Agreement.

If we default under the Loan Agreement, Innovatus may accelerate all of our repayment obligations and, if we are unable to access funds to meet those obligations or to renegotiate our agreement, Innovatus could take control of our pledged assets and we could immediately cease operations. As of October 17, 2019, we were in non-compliance with the Revenue Covenant. In addition, we may become non-compliant with the Liquidity Covenant in the near future. Although we have obtained the Waiver from Innovatus and expect to comply with the terms of the Waiver, such that our non-compliance with each of the Revenue Covenant and Liquidity Covenant (if applicable) shall be deemed cured and no event of default under the Loan Agreement had occurred, there can be no assurance that we will be able

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to maintain compliance with the covenants in the Loan Agreement in the future. If we were unable to obtain a waiver of any breach under the Loan Agreement Innovatus could declare an event of default or require us to renegotiate the Loan Agreement on terms that may be significantly less favorable to us. If we were liquidated, Innovatus' right to repayment would be senior to the rights of our stockholders to receive any proceeds from the liquidation. Any declaration by Innovatus 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 Loan Agreement. 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.

***Our recurring losses, negative cash flows, significant accumulated deficit, and recent non-compliance with Loan Agreement covenants 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 from operating activities, and have significant accumulated deficit. In addition, we were recently out of compliance with certain of the Loan Agreement covenants. We expect to continue to generate operating losses and consume significant cash resources for the foreseeable future and there can be no assurance as to our ability to remain in compliance with Loan Agreement. 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. For example, in connection with the audit of our 2018 financial statements, the report of our independent registered public accounting firm expressed an unqualified opinion and included an explanatory paragraph expressing substantial doubt about our ability to continue as a going concern. Similarly, 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. 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.

## SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus and the documents incorporated by reference herein contain forward-looking statements that reflect our management's beliefs and views with respect to future events and are subject to substantial risks and uncertainties within the meaning of Section 27A of the Securities Act, Section 21E of the Securities Exchange Act of 1934, as amended and the safe harbor provisions for the U.S. Private Securities Litigation Reform Act of 1995. All statements, other than statements of historical fact, contained in this prospectus and the documents incorporated by reference herein, including statements regarding our strategy, future operations, future financial position, future revenue, projected costs, prospects, plans and objectives of management, are forward-looking statements. In some cases, forward-looking statements can be identified by the use of forward-looking words such as "aim," "anticipate," "believe," "contemplate," "continue," "could," "estimate," "expect," "intend," "may," "plan," "potential," "predict," "pro forma," "project," "seek," "should," "target," "will," "would" or other similar words or expressions (including their use in the negative), or by discussions of future matters such as the development of products, technology enhancements, possible changes in legislation, and other statements that are not historical.

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 and the documents incorporated by reference herein, 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;
- our ability to sell shares of common stock to Aspire Capital pursuant to the terms of the Purchase Agreement and our ability to register and maintain the registration of the shares issued and issuable thereunder; and
- our anticipated use of the net proceeds from the potential sale of shares of our common stock to Aspire Capital.

We may not actually achieve the plans, intentions or expectations disclosed in our forward-looking statements. We operate in a very competitive and rapidly changing environment. It is not possible for our management to predict all risks, nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements we may make. Actual results or events could differ materially from the plans, intentions and expectations disclosed in the forward-looking statements we make, and accordingly you should not place undue reliance on our forward-looking statements. We have included important factors in the cautionary statements included in this prospectus, particularly in the "Risk Factors" section in this prospectus and the documents incorporated by reference herein, that we believe could cause actual results or events to differ materially from the forward-looking statements that we make. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, joint ventures or investments we may make.

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You should read this prospectus, the documents incorporated by reference herein and the documents that we have filed as exhibits to the registration statement of which this prospectus is a part completely and with the understanding that our actual future results may be materially different from what we expect. We qualify all of the forward-looking statements in this prospectus and the documents incorporated by reference herein by these cautionary statements. Except as required by law, we undertake no obligation to publicly update any forward-looking statements, whether as a result of new information, future events or otherwise.



## USE OF PROCEEDS

We estimate that we will receive net proceeds of approximately \$13.6 million from the sale of the securities offered by us in this offering, assuming a public offering price of \$2.85 per share and accompanying common warrant, which was the last reported sale price of our common stock on The Nasdaq Capital Market on October 16, 2019, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us, and excluding the proceeds, if any, from the exercise of the common warrants issued in this offering.

A \$0.50 increase or decrease in the assumed combined public offering price of \$2.85 per share and accompanying common warrant would increase or decrease the expected net proceeds of the offering to us by approximately \$2.4 million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us. An increase or decrease of 1.0 million shares from the assumed number of shares sold in this offering would increase or decrease the expected net proceeds of the offering to us by approximately \$2.7 million, assuming the combined public offering price of \$2.85 per share and accompanying common warrant remains the same, and after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us.

The principal purposes of this offering are to obtain additional capital to support our operations. As of the date of this prospectus, we have no specific plan for the net proceeds from this offering, or any significant portion thereof. However, we intend to use the net proceeds from this offering primarily for general corporate purposes, including working capital, sales and marketing activities, general and administrative matters and capital expenditures. We may also use a portion of our net proceeds to co-develop, acquire or invest in products, technologies or businesses that are complementary to our business. However, we currently have no agreements or commitments to complete any such transaction.

The foregoing discussion assumes no sale of pre-funded warrants, which if sold, would reduce the number of shares of common stock that we are offering on a one-for-one basis.

We believe that the net proceeds from this offering, together with our existing cash and cash equivalents, will enable us to fund our operations through at least the next 12 months. We have based this estimate on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we expect.

Our management will have broad discretion in the application of the net proceeds from this offering, and investors will be relying on the judgment of our management regarding the application of those net proceeds. 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 the uses described above, we plan to invest these net proceeds in short-term, interest bearing investments, investment-grade instruments, certificates of deposit or direct or guaranteed obligations of the United States. 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.

**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 Innovatus Life Sciences Lending Fund I, LP, our senior lender.

**DILUTION**

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

Our historical net tangible book value as of June 30, 2019 was \$(1.3) million, or \$(0.12) per share of common stock. Our historical net tangible book value is the amount of our total tangible assets less our liabilities. Historical net tangible book value per common share is our historical net tangible book value divided by the number of shares of common stock outstanding as of June 30, 2019.

After giving effect to the sale of shares of common stock and accompanying common warrants in this offering at an assumed public offering price of \$2.85 per share, which was the last reported sale price of our common stock on the Nasdaq Capital Market on October 16, 2019, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us, and excluding the proceeds, if any, from the exercise of the common warrants issued in this offering, our as adjusted net tangible book value as of June 30, 2019 would be \$12.3 million, or \$0.76 per share of common stock. This amount represents an immediate increase in as adjusted net tangible book value of \$0.88 per share to our existing stockholders and an immediate dilution of \$2.09 per share to investors participating in this offering. We determine dilution per share to investors participating in this offering by subtracting as adjusted net tangible book value per share after this offering from the assumed public offering price per share paid by investors participating in this offering.

The following table illustrates this dilution on a per share basis to new investors:

Assumed public offering price per share and accompanying common warrant	\$	2.85
Historical net tangible book value per share as of June 30, 2019	\$	(0.12)
Increase in as adjusted net tangible book value per share attributable to this offering		<u>0.88</u>
As adjusted net tangible book value per share after giving effect to this offering		<u>0.76</u>
Dilution per share to new investors in this offering	\$	<u>2.09</u>

The as-adjusted dilution information discussed above is illustrative only and will change based on the actual public offering price. Each \$0.50 increase (decrease) in the assumed public offering price of \$2.85 per share and accompanying common warrant, which was the last reported sale price of our common stock on the Nasdaq Capital Market on October 16, 2019, would increase (decrease) the as-adjusted net tangible book value per share by \$0.15 per share and the dilution per share to investors participating in this offering by \$0.35 per share, assuming that the number of shares and accompanying common warrants offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us, and excluding the proceeds, if any, from the exercise of the common warrants issued in this offering.

We may also increase or decrease the number of shares we are offering. A 1.0 million share increase in the number of shares and accompanying common warrants offered by us, as set forth on the cover page of this prospectus, would increase the as adjusted net tangible book value per share by \$0.11 and decrease the dilution per share to new investors participating in this offering by \$0.11, assuming the assumed public offering price of \$2.85 per share, which was the last reported sale price of our common stock on the Nasdaq Capital Market on October 16, 2019, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us, and excluding the proceeds, if any, from the exercise of the common warrants issued in this offering. A 1.0 million share decrease in the number of shares and accompanying common warrants offered by us, as set forth on the cover page of this prospectus, would decrease the as adjusted net tangible book value per share after this offering by \$0.11 and increase the dilution per share to new investors participating in this offering by \$0.11, assuming the assumed public offering price of \$2.85 per share, which was the last reported sale price of our common stock on the Nasdaq Capital Market on October 16, 2019, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us, and excluding the proceeds, if any, from the exercise of the common warrants issued in this offering. The information discussed above is illustrative only and will adjust based on the actual public offering price, the actual number of shares and common warrants that we offer

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in this offering, and other terms of this offering determined at pricing. The discussion and table above assume (i) no sale of pre-funded warrants, which, if sold, would reduce the number of shares of common stock that we are offering on a one-for-one basis and (ii) no exercise of common warrants accompanying the shares of common stock sold in this offering.

**SELECTED FINANCIAL DATA**

The selected statements of operations data for the years ended December 31, 2017 and 2018 and the balance sheet data as of December 31, 2017 and 2018 are derived from our audited financial statements appearing in our Annual Report on Form 10-K for the year ended December 31, 2018, which is incorporated by reference herein. The selected statements of operations data for the six months ended June 30, 2018 and 2019 and the balance sheet data as of June 30, 2019 are derived from our unaudited financial statements appearing in our Quarterly Report on Form 10-Q for the quarter ended June 30, 2019, which is incorporated by reference herein. 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” section and our financial statements and the related notes in our Annual Report on Form 10-K for the year ended December 31, 2018 and in our Quarterly Report on Form 10-Q for the quarter ended June 30, 2019, which are incorporated by reference herein. 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,	
	2017	2018	2018	2019
	(unaudited)			
Total revenue	\$ 9,505,043	12,000,735	\$ 5,158,494	\$ 4,027,381
Operating expenses				
Cost of revenue	6,030,512	8,711,326	2,654,879	2,702,288
Research and development	12,009,170	9,484,163	4,465,919	4,507,803
Selling, general and administrative	14,079,658	14,220,331	6,385,378	9,846,607
Impairment of property and equipment	604,511	—	—	—
Total operating expenses	32,723,851	32,415,820	13,506,176	17,056,698
Interest expense	(590,927)	(1,381,024)	(709,616)	(838,392)
Other income (expense)	462,923	3,315,228	1,907,742	(1,639,628)
Provision for income taxes	(18,552)	(15,511)	(9,282)	(8,972)
Net loss	\$ (23,365,364)	(18,496,392)	\$ (7,158,838)	(15,516,309)
Net loss per share: <sup>(1)</sup>				
Basic and diluted	\$ (8.65)	\$ (2.61)	\$ (1.37)	\$ (1.47)
	Year Ended December 31		As of June 30	
	2017	2018	2019	
	(unaudited)			
<b>Balance Sheet Data:</b>				
Cash and cash equivalents	\$ 1,021,897	\$ 16,522,729	\$ 15,294,526	
Working capital	(9,512,886)	18,502,256	16,390,971	
Total assets	10,145,153	24,802,421	25,210,868	
Convertible note	—	—	—	
Long-term debt	6,729,752	9,029,374	18,621,696	
Total liabilities	17,362,227	14,665,070	26,555,678	
Convertible preferred stock	43,010,137	—	—	
Accumulated deficit	(54,266,036)	(72,762,428)	(88,278,737)	
Total stockholders' (deficit) equity	(50,227,211)	10,137,351	(1,344,810)	

**PRINCIPAL STOCKHOLDERS**

The following table sets forth information regarding beneficial ownership of our capital stock as of July 31, 2019 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 of our named executive officers; and
- all of our current executive officers and directors as a group.

The percentage ownership information shown in the column titled “Before Offering” in the table is based on 10,897,522 shares of common stock outstanding as of July 31, 2019. The percentage ownership information shown in the column titled “After Offering” in the table is based upon 16,162,522 shares, assuming the sale of 5,265,000 shares of our common stock and accompanying common warrants by us in this offering.

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 common stock issuable pursuant to the exercise of stock options or warrants that are exercisable as of September 29, 2019, which is 60 days after July 31, 2019. 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.

The following table is based upon information supplied by officers, directors and principal stockholders and Schedules 13D and 13G, if any, filed with the SEC. Unless otherwise indicated in the footnotes to this table and subject to community property laws where applicable, we believe that each of the stockholders named in this table has sole voting and investment power with respect to the shares indicated as beneficially owned.

Unless otherwise indicated, the address for each beneficial owner listed in the table below is c/o Bionano Genomics, Inc., 9540 Towne Centre Drive, Suite 100, San Diego, California 92121.

Name of Beneficial Owner	Number of Shares Beneficially Owned	Percentage of Shares Beneficially Owned	
		Before Offering	After Offering
<b>Greater than 5% Stockholders</b>			
LC Fund VI, L.P. and Related Entities <sup>(1)</sup>	2,906,915	26.7%	18.0%
Wealth Strategy Holding Limited <sup>(2)</sup>	1,950,000	16.4%	11.4%
AIGH Capital Management, LLC and Affiliates <sup>(3)</sup>	651,802	6.0%	4.0%
Entities affiliated with Domain Partners VIII, L.P. <sup>(4)</sup>	965,769	8.9%	6.0%
Sio Capital Management, LLC <sup>(5)</sup>	1,389,842	12.0%	8.3%
ETP Global Fund, LP <sup>(6)</sup>	1,005,400	9.0%	6.1%
Entities affiliated with Innovatus Life Sciences GP, LP <sup>(7)</sup>	568,491	5.1%	3.5%
<b>Directors and Named Executive Officers</b>			
David L. Barker, Ph.D. <sup>(8)</sup>	28,258	*	*
R. Erik Holmlin, Ph.D. <sup>(9)</sup>	252,020	2.3%	1.5%
Albert Luderer, Ph.D. <sup>(10)</sup>	16,777	*	*
Warren Robinson <sup>(11)</sup>	67,546	*	*
Christopher Twomey <sup>(12)</sup>	28,690	*	*
Junfeng Wang <sup>(1)</sup>	2,915,605	26.7%	18.0%
Mike Ward <sup>(13)</sup>	58,942	*	*
Quan Zhou <sup>(1)</sup>	2,915,605	26.7%	18.0%
Kristiina Vuori, M.D., Ph.D. <sup>(14)</sup>	2,522	*	*
<b>All directors and executive officers as a group (10 persons)<sup>(15)</sup></b>	<b>6,356,734</b>	<b>30.2%</b>	<b>20.7%</b>

\* Represents beneficial ownership of less than 1%.

(1) Based solely on a Schedule 13G filed with the SEC by the reporting persons on June 7, 2019, the indicated ownership consists of (i) 426,900 shares of common stock held by LC Fund VI, L.P., (ii) 20,656 shares of common stock held by LC Parallel Fund VI, L.P., (iii) 1,325,359 shares of common stock held by LC Healthcare Fund I, L.P., and (iv) 1,134,000 shares of common stock held by Rosy Shine Limited, (v) 8,690 shares of common stock subject to options exercisable as of September 29, 2019 held by Junfeng Wang and

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(vi) 8,690 shares of common stock subject to options exercisable as of September 29, 2019 held by Quan Zhou. Each of LC Fund VIc, 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 and Quan Zhou are Managing Directors of Legend Capital. Each of these individual managers of Legend Capital shares voting and investment power over the shares held by the LC Funds. 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). 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 principal place of business for each of the above entities except Legend Holdings is Legend Capital, 16/F, Tower B, Raycom Infotech Park, No.2 Kexueyuan South Road, Zhongguancun, Haidian District, Beijing 100190, People's Republic of China. The Schedule 13G filed by the reporting persons provides information as of April 2, 2019 and, consequently, the beneficial ownership of the reporting persons may have changed between April 2, 2019 and October 17, 2019. The address of the principal place of business for Legend Holdings is Room 1701, 17/F, Block 1, Court No. 2, Ke Xue Yuan Nanlu, Haidian District, Beijing, People's Republic of China.

- (2) Based solely on a Schedule 13G filed with the SEC by the reporting person on December 14, 2018, the indicated ownership consists of 975,000 shares of common stock and 975,000 shares of common stock issuable upon the exercise of warrants held by Wealth Strategy Holding Limited. According to the Schedule 13G, Mr. Kung Hung Ka may be deemed to have sole voting and dispositive power with respect to the shares held by Wealth Strategy Holding Limited. The Schedule 13G/A filed by the reporting person provides information as of August 21, 2018 and, consequently, the beneficial ownership of the reporting person may have changed between August 21, 2018 and October 17, 2019. The address for Wealth Strategy Holding Limited listed in the Schedule 13G is Level 12, International Commerce Centre, 1 Austin Road West, Kowloon, Hong Kong.
- (3) Based solely on a Schedule 13G filed with the SEC by the reporting person on February 15, 2019, the indicated ownership consists of (i) 651,802 shares of common stock held by AIGH Capital Management, LLC and (ii) 651,802 shares of common stock held by Orin Hirschman. According to the Schedule 13G, Mr. Hirschman is the Managing Member of AIGH Capital Management, LLC and may be deemed to have sole voting and dispositive power with respect to the shares held by AIGH Capital Management, LLC and himself. The Schedule 13G/A filed by the reporting person provides information as of December 31, 2018 and, consequently, the beneficial ownership of the reporting person may have changed between December 31, 2018 and October 17, 2019. The address of both AIGH Capital Management, LLC and Mr. Hirschman is 6006 Berkeley Avenue, Baltimore, MD 21209.
- (4) Based solely on a Schedule 13G filed with the SEC by the reporting person on January 11, 2019, the indicated ownership consists of (i) 958,878 shares of common stock and 15,000 shares of common stock issuable upon the exercise of warrants held by Domain Partners VIII, L.P. and (ii) 6,891 shares of common stock held by DP VIII Associates, L.P., 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. The Schedule 13G/A filed by the reporting person provides information as of December 31, 2018 and, consequently, the beneficial ownership of the reporting person may have changed between December 31, 2018 and October 17, 2019. The address for the Domain Entities is One Palmer Square, Suite 515, Princeton, NJ 08542.
- (5) Based solely on a Schedule 13G filed with the SEC by the reporting person on February 14, 2019, the indicated ownership consists of 714,842 shares of common stock held by Sio Capital Management, LLC. According to the Schedule 13G, Sio Capital Management, LLC, or Sio, and Sio GP, LLC, or GP, act as investment advisor and general partner, respectively, to various clients that are the record owners of the common stock held by Sio. Because Sio's investment discretion with respect to such clients is subject to oversight by the GP, the GP may be deemed to be the beneficial owner of the common stock owned by such clients. Both Sio and the GP are controlled by Michael Castor, who may be deemed to control the voting and dispositive decisions with respect to the shares of common stock held by Sio. The Schedule 13G/A filed by the reporting person provides information as of December 31, 2018 and, consequently, the beneficial ownership of the reporting person may have changed between December 31, 2018 and October 17, 2019. The address for Sio is 535 Fifth Avenue, Suite 910, New York, New York 10017.
- (6) 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.
- (7) Based solely on a Schedule 13D filed with the SEC by the reporting persons on April 2, 2019, the indicated ownership consists of (i) 312,758 shares of common stock and 161,987 shares of common stock issuable upon the exercise of warrants held by Innovatus Life Sciences Lending Fund I, LP, or Innovatus Fund, and (ii) 93,746 shares of common stock held by Innovatus Life Sciences Offshore Fund I, LP, or Innovatus Offshore Fund. Innovatus Life Sciences GP, LP, or Innovatus GP, is the general partner of Innovatus Fund. Innovatus Capital Partners LLC, or Innovatus Manager, serves as investment manager to each of Innovatus Fund and Innovatus Offshore Fund. Innovatus Life Sciences Offshore GP, LP, or Innovatus Offshore GP, is the general partner of Innovatus Offshore Fund. Each of Innovatus GP, Innovatus Fund, Innovatus Manager, Innovatus Offshore GP and Innovatus Offshore Fund are collectively referred to as the Innovatus Entities. Innovatus Flagship Parent GP, LLC, or Innovatus Holdings, is the parent company of Innovatus GP and Innovatus Offshore Parent GP, LLC, or Innovatus Offshore Holdings. David Schiff, a citizen of the United States, is the principal shareholder of each of Innovatus Holdings and Innovatus Offshore Holdings, collectively referred to as the Parent Entities, and could be deemed to exercise voting and investment power over the Parent Entities and the Innovatus Entities. The Schedule 13D filed by the reporting persons provides information as of April 2, 2019 and, consequently, the beneficial ownership of the reporting persons may have changed between April 2, 2019 and October 17, 2019. The address of the principal place of business for each of the Parent Entities and David Schiff is 777 Third Avenue, 25th Floor New York, NY 10017.
- (8) Consists of (i) 3,894 shares of common stock, (ii) 20,470 shares of common stock subject to options exercisable as of September 29, 2019 and (iii) 3,894 shares of common stock issuable upon the exercise of warrants.
- (9) Consists of (i) 2,298 shares of common stock, (ii) 248,092 shares of common stock subject to options exercisable as of September 29, 2019 and (iii) 1,630 shares of common stock issuable upon the exercise of warrants.
- (10) Consists of 16,777 shares of common stock subject to options exercisable as of September 29, 2019.
- (11) Consists of (i) 2,527 shares of common stock and (ii) 65,019 shares of common stock subject to options exercisable as of September 29, 2019.



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- (12) Consists of (i) 10,000 shares of common stock, (ii) 8,690 shares of common stock subject to options exercisable as of September 29, 2019 and (iii) 10,000 shares of common stock issuable upon the exercise of warrants.
- (13) Consists of 58,942 shares of common stock subject to options exercisable as of September 29, 2019.
- (14) Consists of 2,522 shares of common stock subject to options exercisable as of September 29, 2019.
- (15) Consists of shares identified in the list of Directors and Named Executive Officers above plus (i) 8,331 shares of common stock, (ii) 61,623 shares of common stock subject to options exercisable as of September 29, 2019, and (iii) 815 shares of common stock issuable upon the exercise of warrants.

## DESCRIPTION OF CAPITAL STOCK

The following description of our capital stock, certain provisions of our certificate of incorporation and bylaws, and certain provisions of Delaware law are summaries. The following description is not complete and is subject to and qualified in its entirety by our certificate of incorporation and 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.

As of the date of this prospectus, our certificate of incorporation authorized us to issue 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.

### **Common Stock**

#### ***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 certificate of incorporation or required by applicable law, all shares of common stock have the same rights and privileges and rank equally, share ratably, and are 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 are 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 to be issued in this offering will be, fully paid and nonassessable.

### **Convertible Preferred Stock**

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.

### **Anti-Takeover Provisions**

The provisions of Delaware law, our eighth amended and restated certificate of incorporation and our amended and restated bylaws, certain provisions of 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

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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 may be able to elect all of our directors. Our amended and restated certificate of incorporation and amended and restated bylaws 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 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. Our board of directors is divided into three classes with staggered three-year terms.

The foregoing provisions make it 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***

We are 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 is 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 is the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act. However, a Delaware court recently held that such an exclusive forum provision relating to federal courts was unenforceable under Delaware law, and unless and until the Delaware court decision is reversed on appeal or otherwise abrogated, we do not intend to enforce such a provision in the event of a complaint asserting a cause of action arising under the Securities Act. These choice of forum provisions of our amended and restated certificate of incorporation will not apply to suits brought to enforce a duty or liability created by the Securities Exchange Act of 1934, as amended.

## DESCRIPTION OF SECURITIES WE ARE OFFERING

We are offering (i) 5,265,000 shares of our common stock or pre-funded warrants to purchase shares of our common stock and (ii) common warrants to purchase up to an aggregate of 5,265,000 shares of our common stock. Each share of common stock or pre-funded warrant is being sold together with a common warrant to purchase one share of common stock. The shares of common stock or pre-funded warrants and accompanying common warrants will be issued separately. We are also registering the shares of common stock issuable from time to time upon exercise of the pre-funded warrants and common warrants offered hereby.

### Common Stock

The material terms and provisions of our common stock and each other class of our securities which qualifies or limits our common stock are described under the caption “Description of Capital Stock” in this prospectus.

### Pre-Funded Warrants

*The following summary of certain terms and provisions of pre-funded warrants that are being offered hereby is not complete and is subject to, and qualified in its entirety by, the provisions of the pre-funded warrant, the form of which is filed as an exhibit to the registration statement of which this prospectus forms a part. Prospective investors should carefully review the terms and provisions of the form of pre-funded warrant for a complete description of the terms and conditions of the pre-funded warrants.*

*Duration and Exercise Price.* Each pre-funded warrant offered hereby will have an initial exercise price per share equal to \$0.001. The pre-funded warrants will be immediately exercisable and may be exercised at any time until the pre-funded warrants are exercised in full. The exercise price and number of shares of common stock issuable upon exercise is subject to appropriate adjustment in the event of stock dividends, stock splits, reorganizations or similar events affecting our common stock and the exercise price. The pre-funded warrants will be issued separately from the accompanying common warrants, and may be transferred separately immediately thereafter.

*Exercisability.* The pre-funded warrants will be exercisable, at the option of each holder, in whole or in part, by delivering to us a duly executed exercise notice accompanied by payment in full for the number of shares of our common stock purchased upon such exercise (except in the case of a cashless exercise as discussed below). Purchasers of the pre-funded warrants in this offering may elect to deliver their exercise notice following the pricing of the offering and prior to the issuance of the pre-funded warrants at closing to have their pre-funded warrants exercised immediately upon issuance and receive shares of common stock underlying the pre-funded warrants upon closing of this offering. A holder (together with its affiliates) may not exercise any portion of the pre-funded warrant to the extent that the holder would own more than 4.99% of the outstanding common stock immediately after exercise, except that upon at least 61 days’ prior notice from the holder to us, the holder may increase the amount of ownership of outstanding stock after exercising the holder’s pre-funded warrants up to 9.99% of the number of shares of our common stock outstanding immediately after giving effect to the exercise, as such percentage ownership is determined in accordance with the terms of the pre-funded warrants. Purchasers of pre-funded warrants in this offering may also elect prior to the issuance of the pre-funded warrants to have the initial exercise limitation set at 9.99% of our outstanding common stock. No fractional shares of common stock will be issued in connection with the exercise of a pre-funded warrant. In lieu of fractional shares, we will round down to the next whole share.

*Cashless Exercise.* If, at the time a holder exercises its pre-funded warrants, a registration statement registering the issuance of the shares of common stock underlying the pre-funded warrants under the Securities Act is not then effective or available, then in lieu of making the cash payment otherwise contemplated to be made to us upon such exercise in payment of the aggregate exercise price, the holder may elect instead to receive upon such exercise (either in whole or in part) the net number of shares of common stock determined according to a formula set forth in the pre-funded warrants.

*Transferability.* Subject to applicable laws, a pre-funded warrant may be transferred at the option of the holder upon surrender of the pre-funded warrant to us together with the appropriate instruments of transfer.

*Exchange Listing.* There is no trading market available for the pre-funded warrants on any securities exchange or nationally recognized trading system. We do not intend to list the pre-funded warrants on any securities exchange or nationally recognized trading system.

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*Right as a Stockholder.* Except as otherwise provided in the pre-funded warrants or by virtue of such holder's ownership of shares of our common stock, the holders of the pre-funded warrants do not have the rights or privileges of holders of our common stock, including any voting rights, until they exercise their pre-funded warrants.

*Fundamental Transaction.* In the event of a fundamental transaction, as described in the pre-funded warrants and generally including any reorganization, recapitalization or reclassification of our common stock, the sale, transfer or other disposition of all or substantially all of our properties or assets, our consolidation or merger with or into another person, the acquisition of more than 50% of our outstanding common stock, or any person or group becoming the beneficial owner of 50% of the voting power represented by our outstanding common stock, the holders of the pre-funded warrants will be entitled to receive upon exercise of the pre-funded warrants the kind and amount of securities, cash or other property that the holders would have received had they exercised the pre-funded warrants immediately prior to such fundamental transaction.

### **Common Warrants**

*The following summary of certain terms and provisions of Common Warrants that are being offered hereby is not complete and is subject to, and qualified in its entirety by, the provisions of the Common Warrants, the form of which is filed as an exhibit to the registration statement of which this prospectus forms a part. Prospective investors should carefully review the terms and provisions of the form of Common Warrants for a complete description of the terms and conditions of the common warrants.*

*Duration and Exercise Price.* Each common warrant offered hereby will have an initial exercise price per share equal to \$ . The common warrants will be immediately exercisable and will expire on the fifth anniversary of the original issuance date. The exercise price and number of shares of common stock issuable upon exercise is subject to appropriate adjustment in the event of stock dividends, stock splits, reorganizations or similar events affecting our common stock and the exercise price. The common warrants will be issued separately from the common stock, and may be transferred separately immediately thereafter. A common warrant to purchase one share of our common stock will be issued for every one share of common stock purchased in this offering.

*Exercisability.* The common warrants will be exercisable, at the option of each holder, in whole or in part, by delivering to us a duly executed exercise notice accompanied by payment in full for the number of shares of our common stock purchased upon such exercise (except in the case of a cashless exercise as discussed below). A holder (together with its affiliates) may not exercise any portion of the common warrant to the extent that the holder would own more than 4.99% of the outstanding common stock immediately after exercise, except that upon at least 61 days' prior notice from the holder to us, the holder may increase the amount of ownership of outstanding stock after exercising the holder's common warrants up to 9.99% of the number of shares of our common stock outstanding immediately after giving effect to the exercise, as such percentage ownership is determined in accordance with the terms of the common warrants. No fractional shares of common stock will be issued in connection with the exercise of a common warrant. In lieu of fractional shares, we will round down to the next whole share.

*Cashless Exercise.* If, at the time a holder exercises its common warrants, a registration statement registering the issuance of the shares of common stock underlying the common warrants under the Securities Act is not then effective or available and an exemption from registration under the Securities Act is not available for the issuance of such shares, then in lieu of making the cash payment otherwise contemplated to be made to us upon such exercise in payment of the aggregate exercise price, the holder may elect instead to receive upon such exercise (either in whole or in part) the net number of shares of common stock determined according to a formula set forth in the common warrants.

*Transferability.* Subject to applicable laws, a common warrant in book entry form may be transferred at the option of the holder through the facilities of the Depository Trust Company and common warrants in physical form may be transferred upon surrender of the common warrant to the warrant agent together with the appropriate instruments of transfer.

*Exchange Listing.* There is no established public trading market for the common warrants, and we do not expect a market to develop. In addition, we do not intend to list the common warrants on any securities exchange or nationally recognized trading system. Without an active trading market, the liquidity of the common warrants will be limited.

*Right as a Stockholder.* Except as otherwise provided in the common warrants or by virtue of such holder's ownership of shares of our common stock, the holders of the common warrants do not have the rights or privileges of holders of our common stock, including any voting rights, until they exercise their common warrants.

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*Fundamental Transaction.* In the event of a fundamental transaction, as described in the form of common warrant, and generally including any reorganization, recapitalization or reclassification of our common stock, the sale, transfer or other disposition of all or substantially all of our properties or assets, our consolidation or merger with or into another person, the acquisition of more than 50% of our outstanding common stock, or any person or group becoming the beneficial owner of 50% of the voting power represented by our outstanding common stock, the holders of the common warrants will be entitled to receive upon exercise of the common warrants the kind and amount of securities, cash or other property that the holders would have received had they exercised the common warrants immediately prior to such fundamental transaction.

**UNDERWRITING**

We entered into an underwriting agreement with the underwriters named below on \_\_\_\_\_, 2019. Oppenheimer & Co. Inc. is acting as the sole book-running manager and representative of the underwriters. The underwriting agreement provides for the purchase of a specific number of shares of common stock and/or pre-funded warrants and accompanying common warrants to purchase shares of common stock by each of the underwriters. The underwriters' obligations are several, which means that each underwriter is required to purchase a specified number of shares of common stock and/or pre-funded warrants and accompanying common warrants, but is not responsible for the commitment of any other underwriter to purchase shares of common stock and/or pre-funded warrants and accompanying common warrants. Subject to the terms and conditions of the underwriting agreement, each underwriter has severally agreed to purchase the number of shares set forth opposite its name below:

<b>Underwriter</b>	<b>Number of Shares of Common Stock</b>	<b>Number of Pre-Funded Warrants</b>	<b>Number of Common Warrants</b>
Oppenheimer & Co. Inc.			
Roth Capital Partners, LLC			
Maxim Group LLC			
Total			

The underwriters have agreed to purchase all of the shares of common stock and/or pre-funded warrants and accompanying common warrants offered by this prospectus, if any are purchased.

The shares of common stock and/or pre-funded warrants and accompanying common warrants offered hereby are expected to be ready for delivery on or about \_\_\_\_\_, 2019 against payment in immediately available funds.

The underwriters are offering the shares of common stock and/or pre-funded warrants and accompanying common warrants subject to various conditions and may reject all or part of any order. The representative of the underwriters has advised us that the underwriters propose initially to offer the shares of common stock and/or pre-funded warrants and accompanying common warrants to purchase shares of common stock to the public at the public offering price set forth on the cover page of this prospectus and to dealers at a price less a concession not in excess of \$ \_\_\_\_\_ per share and accompanying common warrant or \$ \_\_\_\_\_ per pre-funded warrant and accompanying common warrant, based on the combined public offering price per share and accompanying common warrant or pre-funded warrant and accompanying common warrant, to brokers and dealers. After the shares of common stock and/or pre-funded warrants and accompanying common warrants are released for sale to the public, the representative may change the offering price, the concession, and other selling terms at various times.

The following table provides information regarding the amount of the discounts and commissions to be paid to the underwriters by us, before expenses:

	<b>Per Share</b>	<b>Per Pre-Funded Warrant</b>	<b>Per Common Warrant</b>	<b>Total Per Share and Accompanying Common Warrant</b>	<b>Total Per Pre-Funded Warrant and Accompanying Common Warrant</b>
Public offering price	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
Underwriting discounts and commissions <sup>(1)</sup>	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
Proceeds, before expenses, to us	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____

(1) We have agreed to pay the underwriters a commission of 7% of the gross proceeds of this offering.

We estimate that our total expenses of the offering, excluding the estimated underwriting discounts and commissions, will be approximately \$335,000, which includes the fees and expenses for which we have agreed to reimburse the underwriters, provided that any such fees and expenses in excess of an aggregate of \$100,000 will be subject to our prior written approval.

We have agreed to indemnify the underwriters against certain liabilities, including liabilities under the Securities Act of 1933.

We, our officers and directors have agreed to a 90-day "lock-up" with respect to shares of our common stock and other of our securities that they beneficially own, including securities that are convertible into shares of common



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stock and securities that are exchangeable or exercisable for shares of common stock. This means that, subject to certain exceptions, for a period of 90 days following the date of this prospectus, we and such persons may not offer, sell, pledge or otherwise dispose of these securities without the prior written consent of Oppenheimer & Co. Inc.

Rules of the Securities and Exchange Commission may limit the ability of the underwriters to bid for or purchase shares before the distribution of the shares is completed. However, the underwriters may engage in the following activities in accordance with the rules:

- Stabilizing transactions - the representative may make bids or purchases for the purpose of pegging, fixing or maintaining the price of the shares, so long as stabilizing bids do not exceed a specified maximum.
- Penalty bids - if the representative purchases shares in the open market in a stabilizing transaction or syndicate covering transaction, it may reclaim a selling concession from the underwriters and selling group members who sold those shares as part of this offering.
- Passive market making - market makers in the shares who are underwriters or prospective underwriters may make bids for or purchases of shares, subject to limitations, until the time, if ever, at which a stabilizing bid is made.

Similar to other purchase transactions, the underwriters' purchases to cover the syndicate short sales or to stabilize the market price of our common stock may have the effect of raising or maintaining the market price of our common stock or preventing or mitigating a decline in the market price of our common stock. As a result, the price of the shares of our common stock may be higher than the price that might otherwise exist in the open market. The imposition of a penalty bid might also have an effect on the price of the shares if it discourages resales of the shares.

Neither we nor the underwriters make any representation or prediction as to the effect that the transactions described above may have on the price of the shares. These transactions may occur on The Nasdaq Capital Market or otherwise. If such transactions are commenced, they may be discontinued without notice at any time.

Electronic Delivery of Prospectus: A prospectus in electronic format may be delivered to potential investors by one or more of the underwriters participating in this offering. The prospectus in electronic format will be identical to the paper version of such prospectus. 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.

### **Notice to Non-U.S. Investors**

#### *Belgium*

The offering is exclusively conducted under applicable private placement exemptions and therefore it has not been and will not be notified to, and this document or any other offering material relating to the shares has not been and will not be approved by, the Belgian Banking, Finance and Insurance Commission ("Commission bancaire, financière et des assurances/Commissie voor het Bank, Financier en Assurantiewezen"). Any representation to the contrary is unlawful.

Each underwriter has undertaken not to offer sell, resell, transfer or deliver directly or indirectly, any shares, or to take any steps relating/ancillary thereto, and not to distribute or publish this document or any other material relating to the shares or to the offering in a manner which would be construed as: (a) a public offering under the Belgian Royal Decree of 7 July 1999 on the public character of financial transactions; or (b) an offering of securities to the public under Directive 2003/71/EC which triggers an obligation to publish a prospectus in Belgium. Any action contrary to these restrictions will cause the recipient and the company to be in violation of the Belgian securities laws.

#### *Canada*

This document constitutes an "exempt offering document" as defined in and for the purposes of applicable Canadian securities laws. No prospectus has been filed with any securities commission or similar regulatory authority in Canada in connection with the offer and sale of the securities described herein (the "Securities"). No securities commission or similar regulatory authority in Canada has reviewed or in any way passed upon this document or on the merits of the Securities and any representation to the contrary is an offence.

**Canadian investors are advised that this document has been prepared in reliance on section 3A.3 of National Instrument 33-105 *Underwriting Conflicts* ("NI 33-105"). Pursuant to section 3A.3 of NI 33-105, this document**

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is exempt from the requirement to provide investors with certain conflicts of interest disclosure pertaining to “connected issuer” and/or “related issuer” relationships as would otherwise be required pursuant to subsection 2.1(1) of NI 33-105.

### **Resale Restrictions**

The offer and sale of the securities in Canada is being made on a private placement basis only and is exempt from the requirement to prepare and file a prospectus under applicable Canadian securities laws. Any resale of Securities acquired by a Canadian investor in this offering must be made in accordance with applicable Canadian securities laws, which may vary depending on the relevant jurisdiction, and which may require resales to be made in accordance with Canadian prospectus requirements, a statutory exemption from the prospectus requirements, in a transaction exempt from the prospectus requirements or otherwise under a discretionary exemption from the prospectus requirements granted by the applicable local Canadian securities regulatory authority. These resale restrictions may under certain circumstances apply to resales of the Securities outside of Canada.

### **Representations of Purchasers**

Each Canadian investor who purchases the securities will be deemed to have represented to the issuer and to each dealer from whom a purchase confirmation is received, as applicable, that the investor (i) is purchasing as principal, or is deemed to be purchasing as principal in accordance with applicable Canadian securities laws, for investment only and not with a view to resale or redistribution; (ii) is an “accredited investor” as such term is defined in section 1.1 of National Instrument 45-106 *Prospectus Exemptions* (“NI 45-106”) or, in Ontario, as such term is defined in section 73.3(1) of the *Securities Act* (Ontario); and (iii) is a “permitted client” as such term is defined in section 1.1 of National Instrument 31-103 *Registration Requirements, Exemptions and Ongoing Registrant Obligations*.

### **Taxation and Eligibility for Investment**

Any discussion of taxation and related matters contained in this document does not purport to be a comprehensive description of all of the tax considerations that may be relevant to a Canadian investor when deciding to purchase the securities and, in particular, does not address any Canadian tax considerations. No representation or warranty is hereby made as to the tax consequences to a resident, or deemed resident, of Canada of an investment in the securities or with respect to the eligibility of the securities for investment by such investor under relevant Canadian federal and provincial legislation and regulations.

### **Rights of Action for Damages or Rescission**

Securities legislation in certain of the Canadian jurisdictions provides certain purchasers of securities pursuant to an offering memorandum, including where the distribution involves an “eligible foreign security” as such term is defined in Ontario Securities Commission Rule 45-501 *Ontario Prospectus and Registration Exemptions* and in Multilateral Instrument 45-107 *Listing Representation and Statutory Rights of Action Disclosure Exemptions*, as applicable, with a remedy for damages or rescission, or both, in addition to any other rights they may have at law, where the offering memorandum, or other offering document that constitutes an offering memorandum, and any amendment thereto, contains a “misrepresentation” as defined under applicable Canadian securities laws. These remedies, or notice with respect to these remedies, must be exercised or delivered, as the case may be, by the purchaser within the time limits prescribed under, and are subject to limitations and defences under, applicable Canadian securities legislation. In addition, these remedies are in addition to and without derogation from any other right or remedy available at law to the investor.

### **Language of Documents**

Upon receipt of this document, each Canadian investor hereby confirms that it has expressly requested that all documents evidencing or relating in any way to the sale of the securities described herein (including for greater certainty any purchase confirmation or any notice) be drawn up in the English language only. *Par la réception de ce document, chaque investisseur canadien confirme par les présentes qu'il a expressément exigé que tous les documents faisant foi ou se rapportant de quelque manière que ce soit à la vente des valeurs mobilières décrites aux présentes (incluant, pour plus de certitude, toute confirmation d'achat ou tout avis) soient rédigés en anglais seulement.*

#### *France*

Neither this prospectus nor any other offering material relating to the shares has been submitted to the clearance procedures of the Autorité des marchés financiers in France. The shares have not been offered or sold and will not

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be offered or sold, directly or indirectly, to the public in France. Neither this prospectus nor any other offering material relating to the shares has been or will be: (a) released, issued, distributed or caused to be released, issued or distributed to the public in France; or (b) used in connection with any offer for subscription or sale of the shares to the public in France. Such offers, sales and distributions will be made in France only: (i) to qualified investors (investisseurs qualifiés) and/or to a restricted circle of investors (cercle restreint d'investisseurs), in each case investing for their own account, all as defined in and in accordance with Articles L.411-2, D.411-1, D.411-2, D.734-1, D.744-1, D.754-1 and D.764-1 of the French Code monétaire et financier; (ii) to investment services providers authorised to engage in portfolio management on behalf of third parties; or (iii) in a transaction that, in accordance with article L.411-2-II-1°-or-2°-or 3° of the French Code monétaire et financier and article 211-2 of the General Regulations (Règlement Général) of the Autorité des marchés financiers, does not constitute a public offer (appel public à l'épargne). Such shares may be resold only in compliance with Articles L.411-1, L.411-2, L.412-1 and L.621-8 through L.621-8-3 of the French Code monétaire et financier.

### *United Kingdom/Germany/Norway/The Netherlands*

In relation to each Member State of the European Economic Area which has implemented the Prospectus Directive (each, a "Relevant Member State") an offer to the public of any shares which are the subject of the offering contemplated by this prospectus may not be made in that Relevant Member State other than the offers contemplated in this prospectus in name(s) of Member State(s) where prospectus will be approved or passported for the purposes of a non-exempt offer once this prospectus has been approved by the competent authority in such Member State and published and passported in accordance with the Prospectus Directive as implemented in name(s) of relevant Member State(s) 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 authorised or regulated to operate in the financial markets or, if not so authorised 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 representative to fewer than 100 natural or legal persons (other than qualified investors as defined in the Prospectus Directive); 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 the company or any underwriter of a prospectus pursuant to Article 3 of the Prospectus Directive.

For the purposes of this provision, the expression an "offer to the public" in relation to any shares 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 Member State by any measure implementing the Prospectus Directive in that Member State and the expression "Prospectus Directive" means Directive 2003/71/EC and includes any relevant implementing measure in each Relevant Member State.

Each underwriter has represented, warranted and agreed that:

- (a) it has only communicated or caused to be communicated and will only communicate or cause to be communicated any invitation or inducement to engage in investment activity (within the meaning of section 21 of the Financial Services and Markets Act 2000 (the FSMA)) received by it in connection with the issue or sale of any shares in circumstances in which section 21(1) of the FSMA does not apply to the company; and
- (b) it has complied with and will comply with all applicable provisions of the FSMA with respect to anything done by it in relation to the shares in, from or otherwise involving the United Kingdom.

### *Israel*

In the State of Israel, the shares offered hereby may not be offered to any person or entity other than the following:

- (a) a fund for joint investments in trust (i.e., mutual fund), as such term is defined in the Law for Joint Investments in Trust, 5754-1994, or a management company of such a fund;

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- (b) a provident fund as defined in Section 47(a)(2) of the Income Tax Ordinance of the State of Israel, or a management company of such a fund;
- (c) an insurer, as defined in the Law for Oversight of Insurance Transactions, 5741-1981, (d) a banking entity or satellite entity, as such terms are defined in the Banking Law (Licensing), 5741-1981, other than a joint services company, acting for their own account or for the account of investors of the type listed in Section 15A(b) of the Securities Law 1968;
- (d) a company that is licensed as a portfolio manager, as such term is defined in Section 8(b) of the Law for the Regulation of Investment Advisors and Portfolio Managers, 5755-1995, acting on its own account or for the account of investors of the type listed in Section 15A(b) of the Securities Law 1968;
- (e) a company that is licensed as an investment advisor, as such term is defined in Section 7(c) of the Law for the Regulation of Investment Advisors and Portfolio Managers, 5755-1995, acting on its own account;
- (f) a company that is a member of the Tel Aviv Stock Exchange, acting on its own account or for the account of investors of the type listed in Section 15A(b) of the Securities Law 1968;
- (g) an underwriter fulfilling the conditions of Section 56(c) of the Securities Law, 5728-1968;
- (h) a venture capital fund (defined as an entity primarily involved in investments in companies which, at the time of investment, (i) are primarily engaged in research and development or manufacture of new technological products or processes and (ii) involve above-average risk);
- (i) an entity primarily engaged in capital markets activities in which all of the equity owners meet one or more of the above criteria; and
- (j) an entity, other than an entity formed for the purpose of purchasing shares in this offering, in which the shareholders equity (including pursuant to foreign accounting rules, international accounting regulations and U.S. generally accepted accounting rules, as defined in the Securities Law Regulations (Preparation of Annual Financial Statements), 1993) is in excess of NIS 50 million.

Any offeree of the shares offered hereby in the State of Israel shall be required to submit written confirmation that it falls within the scope of one of the above criteria. This prospectus will not be distributed or directed to investors in the State of Israel who do not fall within one of the above criteria.

### *Italy*

The offering of the shares offered hereby in Italy has not been registered with the Commissione Nazionale per la Società e la Borsa ("CONSOB") pursuant to Italian securities legislation and, accordingly, the shares offered hereby cannot be offered, sold or delivered in the Republic of Italy ("Italy") nor may any copy of this prospectus or any other document relating to the shares offered hereby be distributed in Italy other than to professional investors (operatori qualificati) as defined in Article 31, second paragraph, of CONSOB Regulation No. 11522 of 1 July, 1998 as subsequently amended. Any offer, sale or delivery of the shares offered hereby or distribution of copies of this prospectus or any other document relating to the shares offered hereby in Italy must be made:

- (a) by an investment firm, bank or intermediary permitted to conduct such activities in Italy in accordance with Legislative Decree No. 58 of 24 February 1998 and Legislative Decree No. 385 of 1 September 1993 (the "Banking Act");
- (b) in compliance with Article 129 of the Banking Act and the implementing guidelines of the Bank of Italy; and
- (c) in compliance with any other applicable laws and regulations and other possible requirements or limitations which may be imposed by Italian authorities.

### *Sweden*

This prospectus has not been nor will it be registered with or approved by Finansinspektionen (the Swedish Financial Supervisory Authority). Accordingly, this prospectus may not be made available, nor may the shares offered hereunder be marketed and offered for sale in Sweden, other than under circumstances which are deemed not to require a prospectus under the Financial Instruments Trading Act (1991: 980).

*Switzerland*

The shares offered pursuant to this prospectus will not be offered, directly or indirectly, to the public in Switzerland and this prospectus does not constitute a public offering prospectus as that term is understood pursuant to art. 652a or art. 1156 of the Swiss Federal Code of Obligations. The company has not applied for a listing of the shares being offered pursuant to this prospectus on the SWX Swiss Exchange or on any other regulated securities market, and consequently, the information presented in this prospectus does not necessarily comply with the information standards set out in the relevant listing rules. The shares being offered pursuant to this prospectus have not been registered with the Swiss Federal Banking Commission as foreign investment funds, and the investor protection afforded to acquirers of investment fund certificates does not extend to acquirers of shares.

Investors are advised to contact their legal, financial or tax advisers to obtain an independent assessment of the financial and tax consequences of an investment in shares.

## **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. Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., New York, New York has acted as counsel to the underwriters in connection with this offering.

## **EXPERTS**

The consolidated financial statements incorporated in this Prospectus by reference from the Company's Annual Report on Form 10-K for the year ended December 31, 2018 have been audited by Deloitte & Touche LLP, an independent registered public accounting firm, as stated in their report, which is incorporated herein by reference (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 incorporated by reference in reliance upon the report of such firm given upon their authority as experts in accounting and auditing.

## **WHERE YOU CAN FIND MORE INFORMATION**

We have filed with the SEC a registration statement on Form S-1 under the Securities Act, with respect to the securities being offered by this prospectus. This prospectus does not contain all of the information in the registration statement and its exhibits. For further information with respect to us and the securities offered by this prospectus, we refer you to the registration statement and its exhibits. Statements contained in this prospectus as to the contents of any contract or any other document referred to are not necessarily complete, and in each instance, we refer you to the copy of the contract or other document filed as an exhibit to the registration statement. Each of these statements is qualified in all respects by this reference.

We are subject to the information and periodic reporting requirements of the Exchange Act, and we file periodic reports, proxy statements and other information with the SEC. You can read our SEC filings, including the registration statement, over the Internet at the SEC's website at [www.sec.gov](http://www.sec.gov). You may also request a copy of these filings, at no cost, by writing us at 9540 Towne Centre Drive, Suite 100, San Diego, California 92121 or telephoning us at (858) 888-7600. We also maintain a website at [www.bionanogenomics.com](http://www.bionanogenomics.com), at which you may access these materials free of charge after they are electronically filed with, or furnished to, the SEC. The information contained in, or that can be accessed through, our website is not incorporated by reference in, and is not part of, this prospectus.

## INCORPORATION OF CERTAIN INFORMATION BY REFERENCE

The SEC allows us to “incorporate by reference” information from other documents that we file with it, which means that we can disclose important information to you by referring you to those documents. The information incorporated by reference is considered to be part of this prospectus.

We incorporate by reference into this prospectus and the registration statement of which this prospectus form a part the information or documents listed below that we have filed with the SEC, and any future filings we will make with the SEC under Sections 13(a), 13(c), 14, or 15(d) of the Exchange Act after the date of the initial filing of the registration statement of which this prospectus is a part and prior to effectiveness of such registration statement, and until the termination of the offering of the shares covered by this prospectus (other than information furnished under Item 2.02 or Item 7.01 of Form 8-K):

- our Annual Report on Form 10-K for the year ended December 31, 2018 filed with the SEC on [March 14, 2019](#);
- the information specifically incorporated by reference into our Annual Report on Form 10-K for the year ended December 31, 2018 from our Definitive Proxy Statement on Schedule 14A filed with the SEC on [April 24, 2019](#);
- our Quarterly Reports on Form 10-Q for the quarters ended March 31, 2019 and June 30, 2019 filed with the SEC on [May 9, 2019](#) and [August 8, 2019](#), respectively;
- our Current Reports on Form 8-K (other than information furnished rather than filed) filed with the SEC on [January 25, 2019](#), [March 14, 2019](#), [March 22, 2019](#), [May 28, 2019](#), [June 11, 2019](#), [August 22, 2019](#) and [September 19, 2019](#); and
- the description of our common stock which is registered under Section 12 of the Exchange Act, in our registration statement on Form 8-A, filed on [August 17, 2018](#), including any amendment or reports filed for the purposes of updating this description.

Any statement contained in this prospectus or in a document incorporated or deemed to be incorporated by reference into this prospectus will be deemed to be modified or superseded for purposes of this prospectus to the extent that a statement contained in this prospectus or any other subsequently filed document that is deemed to be incorporated by reference into this prospectus modifies or supersedes the statement. Any statements so modified or superseded shall not be deemed, except as so modified or superseded, to constitute a part of this prospectus.

We will furnish without charge to you, on written or oral request, a copy of any or all of the documents incorporated by reference in this prospectus, including exhibits to these documents. You should direct any requests for documents to Bionano Genomics, Inc. 9540 Towne Centre Drive, Suite 100, San Diego, California 92121; telephone: (858) 888-7600.

You also may access these filings on our website at [www.bionanogenomics.com](http://www.bionanogenomics.com). We do not incorporate the information on our website into this prospectus or any supplement to this prospectus and you should not consider any information on, or that can be accessed through, our website as part of this prospectus or any supplement to this prospectus (other than those filings with the SEC that we specifically incorporate by reference into this prospectus).

## DISCLOSURE OF COMMISSION POSITION ON INDEMNIFICATION FOR SECURITIES ACT LIABILITY

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to our directors, officers, and controlling persons, we have been advised that in the opinion of the SEC this indemnification is against public policy as expressed in the Securities Act and is therefore, unenforceable.



**5,265,000 Shares of Common Stock  
Pre-Funded Warrants to Purchase Shares of Common Stock  
Warrants to Purchase up to 5,265,000 Shares of Common Stock**

**PROSPECTUS**

*Sole Book-Running Manager*

**Oppenheimer & Co.**

*Lead Manager*

**Roth Capital Partners**

*Co-Lead Manager*

**Maxim Group LLC**

You should rely only on the information contained in this prospectus. No dealer, salesperson or other person is authorized to give information that is not contained in this prospectus. This prospectus is not an offer to sell nor is it seeking an offer to buy these securities in any jurisdiction where the offer or sale is not permitted. The information contained in this prospectus is correct only as of the date of this prospectus, regardless of the time of the delivery of this prospectus or any sale of these securities.

The date of this prospectus is \_\_\_\_\_, 2019

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**PART II****INFORMATION NOT REQUIRED IN PROSPECTUS****Item 13. Other Expenses of Issuance and Distribution**

The following table sets forth the expenses to be incurred in connection with the offering described in this registration statement, all of which will be paid by the registrant. All amounts are estimates except the SEC registration fee.

	<u>Amount</u>
SEC registration fee	3,896
FINRA filing fee	5,002
Printing and engraving expenses	20,000
Legal fees and expenses	250,000
Accounting fees and expenses	30,000
Transfer agent and registrar fees	5,000
Miscellaneous fees and expenses	21,102
Total	<u>335,000</u>

**Item 14. Indemnification of Directors and Officers**

We are incorporated under the laws of the State of Delaware. Section 145 of the Delaware General Corporation Law provides that a Delaware corporation may indemnify any persons who were, are, or are threatened to be made, parties to any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative (other than an action by or in the right of such corporation), by reason of the fact that such person is or was an officer, director, employee or agent of such corporation, or is or was serving at the request of such corporation as an officer, director, employee or agent of another corporation or enterprise. The indemnity may include expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred by such person in connection with such action, suit or proceeding, provided that such person acted in good faith and in a manner he or she reasonably believed to be in or not opposed to the corporation's best interests and, with respect to any criminal action or proceeding, had no reasonable cause to believe that his or her conduct was illegal. A Delaware corporation may indemnify any persons who were, are, or are threatened to be made, a party to any threatened, pending or completed action or suit by or in the right of the corporation by reason of the fact that such person is or was a director, officer, employee or agent of such corporation, or is or was serving at the request of such corporation as a director, officer, employee or agent of another corporation or enterprise. The indemnity may include expenses (including attorneys' fees) actually and reasonably incurred by such person in connection with the defense or settlement of such action or suit provided such person acted in good faith and in a manner he or she reasonably believed to be in or not opposed to the corporation's best interests except that no indemnification is permitted without judicial approval if the officer or director is adjudged to be liable to the corporation. Where an officer or director is successful on the merits or otherwise in the defense of any action referred to above, the corporation must indemnify him or her against the expenses (including attorneys' fees) actually and reasonably incurred.

Our amended and restated certificate of incorporation and amended and restated bylaws provide for the indemnification of our directors and officers to the fullest extent permitted under the Delaware General Corporation Law.

Section 102(b)(7) of the Delaware General Corporation Law permits a corporation to provide in its certificate of incorporation that a director of the corporation shall not be personally liable to the corporation or its stockholders for monetary damages for breach of fiduciary duties as a director, except for liability for any:

- transaction from which the director derives an improper personal benefit;
- act or omission not in good faith or that involves intentional misconduct or a knowing violation of law;
- unlawful payment of dividends or redemption of shares; or
- breach of a director's duty of loyalty to the corporation or its stockholders.

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Our amended and restated certificate of incorporation includes such a provision. Expenses incurred by any officer or director in defending any such action, suit or proceeding in advance of its final disposition will be paid by us upon delivery to us of an undertaking, by or on behalf of such director or officer, to repay all amounts so advanced if it shall ultimately be determined that such director or officer is not entitled to be indemnified by us.

Section 174 of the Delaware General Corporation Law provides, among other things, that a director who willfully or negligently approves of an unlawful payment of dividends or an unlawful stock purchase or redemption, may be held liable for such actions. A director who was either absent when the unlawful actions were approved or dissented at the time may avoid liability by causing his or her dissent to such actions to be entered in the books containing minutes of the meetings of the board of directors at the time such action occurred or immediately after such absent director receives notice of the unlawful acts.

As permitted by the Delaware General Corporation Law, we have entered into, and continue to enter, into separate indemnity agreements with each of our directors and executive officers that require us to indemnify such persons against any and all costs and expenses (including attorneys', witness or other professional fees) actually and reasonably incurred by such persons in connection with any action, suit or proceeding (including derivative actions), whether actual or threatened, to which any such person may be made a party by reason of the fact that such person is or was a director or officer or is or was acting or serving as an officer, director, employee or agent of ours or any of our affiliated enterprises. Under these agreements, we are not required to provide indemnification for certain matters, including:

- indemnification beyond that permitted by the Delaware General Corporation Law;
- indemnification for any proceeding with respect to the unlawful payment of remuneration to the director or officer;
- indemnification for certain proceedings involving a final judgment that the director or officer is required to disgorge profits from the purchase or sale of our stock;
- indemnification for proceedings involving a final judgment that the director's or officer's conduct was in bad faith, knowingly fraudulent or deliberately dishonest or constituted willful misconduct or a breach of his or her duty of loyalty, but only to the extent of such specific determination;
- indemnification for proceedings or claims brought by an officer or director against us or any of our directors, officers, employees or agents, except for (1) claims to establish a right of indemnification or proceedings, (2) claims approved by our board of directors, (3) claims required by law, (4) when there has been a change of control as defined in the indemnification agreement with each director or officer, or (5) by us in our sole discretion pursuant to the powers vested to us under the Delaware General Corporate Law;
- indemnification for settlements the director or officer enters into without our consent; or
- indemnification in violation of any undertaking required by the Securities Act of 1933, as amended, or the Securities Act, or in any registration statement we file.

The indemnification agreements also set forth certain procedures that will apply in the event of a claim for indemnification thereunder.

There is at present no pending litigation or proceeding involving any of our directors or executive officers as to which indemnification is required or permitted, and we are not currently aware of any threatened litigation or proceeding that may result in a claim for indemnification.

We have an insurance policy in place that covers our officers and directors with respect to certain liabilities, including liabilities arising under the Securities Act or otherwise.

Any underwriting agreement that we may enter into may provide that the underwriters are obligated, under some circumstances, to indemnify our directors, officers and controlling persons against specified liabilities, including liabilities under the Securities Act.

**Item 15. Recent Sales of Unregistered Securities**

Set forth below is information regarding shares of common stock and preferred stock issued, and options granted, by us since January 1, 2016 that were not registered under the Securities Act of 1933, as amended (the Securities Act). Also included is the consideration, if any, received by us for such shares and options and information relating to the section of the Securities Act, or rule of the Securities and Exchange Commission, under which exemption from registration was claimed.

**(a) Issuances of Securities**

On March 14, 2019, we entered into the Common Stock Purchase Agreement with Aspire Capital Fund, LLC, or Aspire Capital. Pursuant to the terms of this agreement, Aspire Capital purchased 272,479 shares of our common stock at \$3.67 per share and we issued 69,444 shares of our common stock to Aspire Capital in consideration for entering into the agreement.

On March 14, 2019, we entered into a Loan and Security Agreement (the “Innovatus Loan Agreement”) with Innovatus Life Sciences Lending Fund I, LP (“Innovatus”), a Delaware limited partnership, as collateral agent and the Lenders listed on Schedule 1.1 thereto, including East West Bank, pursuant to which Innovatus agreed, among other things, to make a first term loan of \$17.5 million to us (the “Term A-1 Loan”), a second term loan of \$2.5 million to us (the “Term A-2 Loan”) and a third term loan of \$5.0 million to us, each upon satisfaction of certain funding conditions as set forth in the Innovatus Loan Agreement. In connection with the funding of any of the term loans, we agreed to issue warrants to Innovatus to purchase shares of our common stock. The warrants will be issued on the funding date of each tranche and will expire ten (10) years from such issue date.

On March 22, 2019, in connection with the receipt of funding with respect to the Term A-1 Loan and Term A-2 Loan, we issued to Innovatus a warrant to purchase up to 161,987 shares of our common stock at an exercise price of \$4.63 per share. The foregoing description is subject to, and qualified in its entirety by, the Loan and Security Agreement and the form of Warrant to Purchase Common Stock filed as exhibits hereto and incorporated herein by reference.

In connection with the Innovatus Loan Agreement, on March 14, 2019, we entered into a Common Stock Purchase Agreement (the “Innovatus Purchase Agreement”) with certain entities affiliated with Innovatus (the “Innovatus Investors”), pursuant to which we agreed to issue and sell 406,504 shares of common stock at \$3.69 per share for proceeds of \$1.5 million (the “Innovatus Shares”). The issuance of the Innovatus Shares to the Innovatus Investors under the Innovatus Purchase Agreement is exempt from registration under the Securities Act, pursuant to the exemption for transactions by an issuer not involving any public offering under Section 4(a)(2) of the Securities Act. The foregoing description is subject to, and qualified in its entirety by, the Innovatus Purchase Agreement filed as an exhibit hereto and incorporated herein by reference.

On November 19, 2018, we entered into an Amendment Agreement (the “Amendment Agreement”) with Western Alliance Bank, an Arizona corporation (the “Holder”), in order to amend (i) that certain Warrant to Purchase Stock, dated March 8, 2016, (ii) that certain Warrant to Purchase Stock, dated December 9, 2016 ((i) and (ii) collectively, the “Bank Warrants”) and (iii) that certain Loan and Security Agreement, dated as of March 8, 2016, as amended (the “Loan Agreement”). Pursuant to the Amendment Agreement, the exercise price of the Bank Warrants was decreased from \$20.56 per share to \$6.99 per share. The foregoing description is subject to, and qualified in its entirety by, the Amendment Agreement filed as an exhibit hereto and incorporated herein by reference.

On November 19, 2018, we issued (i) to LifeSci Capital, LLC, a warrant to purchase 44,183 shares of our common stock, and (ii) to Russell Creative Group, a warrant to purchase 3,311 shares of our common stock (together, the “Service Provider Warrants”), each having an exercise price of \$8.25 per share of our common stock and a term of five years. The Service Provider Warrants were issued in full satisfaction of our obligations to pay (i) to LifeSci Capital, LLC an aggregate of \$150,000 for capital advisory and investor relations services and (ii) to Russell Creative Group an aggregate of \$15,000 for branding and marketing services. LifeSci Capital, LLC and Russell Creative Group are accredited investors and the issuance of the Service Provider Warrants was exempt from registration under the Securities Act in reliance on an exemption provided by Section 4(a)(2) of the Securities Act. The description of the Service Provider Warrants is qualified in its entirety by the form of Warrant to Purchase Common Stock filed as an exhibit hereto and incorporated herein by reference.

On August 23, 2018, in connection with the underwriting agreement related to our IPO, we issued (i) to Roth Capital Partners, a warrant to purchase 68,040 shares of our common stock, (ii) to Maxim Partners LLC, a warrant to purchase 22,680 shares of our common stock and (ii) to LifeSci Capital LLC, a warrant to purchase 10,080 shares

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of our common stock (together, the “Underwriter Warrants”), each having an exercise price of \$9.1875 per share of our common stock and a term of five years. On August 30, 2018, pursuant to the exercise of the underwriters’ over-allotment option, we issued (i) to Roth Capital Partners, a warrant to purchase 10,206 shares of our common stock, (ii) to Maxim Partners LLC, a warrant to purchase 3,402 shares of our common stock and (iii) to LifeSci Capital LLC, a warrant to purchase 1,512 shares of our common stock (together, the “Over-Allotment Warrants”), each having an exercise price of \$9.1875 per share of our common stock and a term of five years. The description of the Underwriter Warrants and the Over-Allotment Warrants is qualified in its entirety by the form of Warrant to Purchase Common Stock issued to the underwriters, filed as an exhibit hereto and incorporated herein by reference.

The offers, sales and issuances of the securities described in this section (a) of Item 15 were deemed to be exempt from registration under the Securities Act in reliance on Section 4(a)(2) of the Securities Act and Rule 506 promulgated under Regulation D promulgated thereunder as transactions by an issuer not involving a public offering. The recipients of securities in each of these transactions acquired the securities for investment only and not with a view to or for sale in connection with any distribution thereof and appropriate legends were affixed to the securities issued in these transactions. Each of the recipients of securities in these transactions was an accredited investor within the meaning of Rule 501 of Regulation D under the Securities Act and had adequate access, through employment, business or other relationships, to information about the Company. No underwriters were involved in these transactions.

### ***(b) Stock Option and Restricted Stock Grants***

From January 1, 2016 to August 21, 2018, we granted stock options under our Amended and Restated 2006 Equity Compensation Plan to purchase an aggregate of 477,034 shares of our common stock, with exercise prices ranging from \$1.30 to \$64.22 per share to certain directors, officers, employees and consultants.

The securities described in this section (b) of Item 15 were deemed to be exempt from registration under the Securities Act in reliance on Rule 701 in that the transactions were under compensatory benefit plans and contracts relating to compensation as provided under Rule 701. The recipients of such securities were the Registrant’s employees, directors or bona fide consultants and received the securities under the Company’s 2006 Equity Incentive Plan and 2018 Equity Incentive Plan. Appropriate legends were affixed to the securities issued in these transactions. Each of the recipients of securities in these transactions had adequate access, through employment, business or other relationships, to information about the Company.

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**Item 16. Exhibits and Financial Statement Schedules**

**(a) Exhibits**

<b>Exhibit Number</b>	<b>Description</b>
1.1	<a href="#"><u>Form of Underwriting Agreement.</u></a>
3.1(1)	<a href="#"><u>Amended and Restated Certificate of Incorporation.</u></a>
3.2(1)	<a href="#"><u>Amended and Restated Bylaws.</u></a>
4.1(2)	<a href="#"><u>Form of Common Stock Certificate.</u></a>
4.2(2)	<a href="#"><u>Form of Warrant to Purchase Series B-1 Preferred Stock issued to Square 1 Bank.</u></a>
4.3(2)	<a href="#"><u>Form of Warrant to Purchase Series D Preferred Stock issued to Western Alliance Bank.</u></a>
4.4(2)	<a href="#"><u>Warrant to Purchase Series D-1 Preferred Stock issued to Western Alliance Bank.</u></a>
4.5(2)	<a href="#"><u>Form of Warrant to Purchase Series D-1 Preferred Stock issued to Midcap Financial Trust.</u></a>
4.6(2)	<a href="#"><u>Form of Warrant to Purchase Common Stock Issued to Underwriters in Initial Public Offering.</u></a>
4.7(2)	<a href="#"><u>Form of Warrant Certificate (included in Exhibit 4.8).</u></a>
4.8(2)	<a href="#"><u>Form of Warrant Agent Agreement by and between the Registrant and American Stock Transfer &amp; Trust Company LLC, as warrant agent.</u></a>
4.9(3)	<a href="#"><u>Form of Warrant to Purchase Common Stock for Service Providers.</u></a>
4.10(4)	<a href="#"><u>Form of Warrant to Purchase Common Stock for Innovatus.</u></a>
4.11(4)	<a href="#"><u>Registration Rights Agreement, dated March 14, 2019, between the Company and Aspire Capital Fund, LLC.</u></a>
4.12(4)	<a href="#"><u>Registration Rights Agreement, dated March 14, 2019, by and among the Company and the Innovatus Investors.</u></a>
4.13†	<a href="#"><u>Form of Warrant to Purchase Common Stock.</u></a>
4.14	<a href="#"><u>Form of Pre-Funded Warrant</u></a>
5.1	<a href="#"><u>Opinion of Cooley LLP.</u></a>
10.1(2)	<a href="#"><u>Fifth Amended and Restated Investors' Rights Agreement, dated August 5, 2016 as amended.</u></a>
10.2+(2)	<a href="#"><u>Bionano Genomics, Inc. Amended and Restated 2006 Equity Compensation Plan (the "2006 Plan").</u></a>
10.3+(2)	<a href="#"><u>Forms of grant notice, stock option agreement and notice of exercise under the 2006 Plan.</u></a>
10.4+(5)	<a href="#"><u>Bionano Genomics, Inc. 2018 Equity Incentive Plan (the "2018 Plan").</u></a>
10.5+(2)	<a href="#"><u>Forms of grant notice, stock option agreement and notice of exercise under the 2018 Plan.</u></a>
10.6+(5)	<a href="#"><u>Bionano Genomics, Inc. 2018 Employee Stock Purchase Plan.</u></a>
10.7+(2)	<a href="#"><u>Form of Indemnification Agreement by and between the Registrant and each director and executive officer.</u></a>
10.8+(2)	<a href="#"><u>Bionano Genomics, Inc. Non-Employee Director Compensation Policy.</u></a>
10.9(2)	<a href="#"><u>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.</u></a>
10.10+(2)	<a href="#"><u>Employment Agreement by and between the Registrant and R. Erik Holmlin, Ph.D., dated November 7, 2017, as amended.</u></a>
10.11+(2)	<a href="#"><u>Employment Agreement by and between the Registrant and Han Cao, Ph.D., dated November 7, 2017, as amended.</u></a>
10.12+(2)	<a href="#"><u>Employment Agreement by and between the Registrant and Mike Ward, dated July 1, 2016.</u></a>
10.13+(2)	<a href="#"><u>Employment Agreement by and between the Registrant and Warren Robinson, dated November 7, 2017.</u></a>
10.14+(2)	<a href="#"><u>Employment Agreement by and between the Registrant and Mark Borodkin, dated November 7, 2017.</u></a>
10.15(2)	<a href="#"><u>Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated March 8, 2016.</u></a>
10.16(2)	<a href="#"><u>First Amendment to the Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated December 9, 2016.</u></a>
10.17(2)	<a href="#"><u>Second Amendment to the Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated May 2, 2017.</u></a>

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<u>Exhibit Number</u>	<u>Description</u>
10.18(2)	<a href="#"><u>Third Amendment to the Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated November 20, 2017.</u></a>
10.19(2)	<a href="#"><u>Forbearance and Fourth Amendment to the Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated February 9, 2018.</u></a>
10.20(2)	<a href="#"><u>Lease by and between the Registrant and The Irvine Company LLC, dated January 16, 2012.</u></a>
10.21(2)	<a href="#"><u>First Amendment to the Lease by and between the Registrant and The Irvine Company LLC, dated September 10, 2013.</u></a>
10.22(2)	<a href="#"><u>Second Amendment to the Lease by and between the Registrant and The Irvine Company LLC, dated July 1, 2015.</u></a>
10.23#(2)	<a href="#"><u>Master Services Agreement by and between the Registrant and Skorpis Technologies, Inc. (f/k/a Novati Technologies, Inc. and f/k/a SVTC Technologies, LLC), dated March 2, 2009, as amended.</u></a>
10.24#(2)	<a href="#"><u>Manufacturing Services Agreement by and between the Registrant and Paramit Corporation, dated February 18, 2015.</u></a>
10.25#(2)	<a href="#"><u>License Agreement by and between Princeton University and the Registrant, dated January 7, 2004.</u></a>
10.26#(2)	<a href="#"><u>First Amendment to the License Agreement by and between Princeton University and the Registrant, dated December 17, 2004.</u></a>
10.27#(2)	<a href="#"><u>Second Amendment to the License Agreement by and between Princeton University and the Registrant, dated February 25, 2010.</u></a>
10.28#(2)	<a href="#"><u>Third Amendment to the License Agreement by and between Princeton University and the Registrant, dated October 17, 2011.</u></a>
10.29#(2)	<a href="#"><u>Fourth Amendment License Agreement by and between Princeton University and the Registrant, dated February 9, 2012.</u></a>
10.30#(2)	<a href="#"><u>Sublicense Agreement by and between the Registrant and Industry 3200 dated December 27, 2013.</u></a>
10.31#(2)	<a href="#"><u>License Agreement by and between the Registrant and Q Biotechnology CV dated May 1, 2014.</u></a>
10.32#(2)	<a href="#"><u>Amendment to Non-Exclusive Patent License Agreement by and between the Registrant and QBiotechnology CV dated May 1, 2014.</u></a>
10.33#(2)	<a href="#"><u>License Agreement by and between the Registrant and New York University dated November 4, 2013.</u></a>
10.34#(2)	<a href="#"><u>Option and Sublicense Agreement by and between the Registrant and Pacific Biosciences of California, Inc. dated February 2, 2016.</u></a>
10.35(2)	<a href="#"><u>Note Purchase Agreement by and among the Registrant and the Investors listed on Exhibit A thereto, dated February 9, 2018.</u></a>
10.36(2)	<a href="#"><u>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.</u></a>
10.37(2)	<a href="#"><u>Fifth Amendment to Loan and Security Agreement by and between the Registrant and Western Alliance Bank, dated June 13, 2018.</u></a>
10.38#(2)	<a href="#"><u>Amendment to Patent Sublicense Agreement by and between the Registrant and Industry 3200, dated June 28, 2018.</u></a>
10.39(2)	<a href="#"><u>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.</u></a>
10.40(2)	<a href="#"><u>Omnibus Amendment to Convertible Promissory Notes by and among the Registrant and the Holders identified in the signature pages thereto, dated June 29, 2018.</u></a>
10.41(2)	<a href="#"><u>Omnibus Amendment to Convertible Promissory Notes by and among the Registrant and the Holders identified in the signature pages thereto, dated August 14, 2018.</u></a>
10.42(2)	<a href="#"><u>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.</u></a>
10.43(2)	<a href="#"><u>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.</u></a>
10.44(3)	<a href="#"><u>Amendment Agreement, by and between the Registrant and Western Alliance Bank, dated November 19, 2018.</u></a>

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<u>Exhibit Number</u>	<u>Description</u>
10.45 <sup>(4)</sup>	<a href="#"><u>Common Stock Purchase Agreement, dated March 14, 2019, between the Registrant and Aspire Capital Fund, LLC.</u></a>
10.46 <sup>(4)</sup>	<a href="#"><u>Loan and Security Agreement, dated March 14, 2019, by and among the Company, Innovatus Life Sciences Lending Fund I, LP and the Lenders listed on Schedule 1.1 thereto.</u></a>
10.47 <sup>(6)</sup>	<a href="#"><u>Waiver and First Amendment to Loan and Security Agreement, dated June 25, 2019, by and among the Company, Innovatus Life Sciences Lending Fund I, LP and East West Bank.</u></a>
21.1 <sup>(2)</sup>	<a href="#"><u>Subsidiaries of the Registrant.</u></a>
23.1	<a href="#"><u>Consent of Deloitte &amp; Touche LLP, independent registered public accounting firm.</u></a>
23.2	<a href="#"><u>Consent of Cooley LLP (included in Exhibit 5.1).</u></a>
24.1†	<a href="#"><u>Power of Attorney (reference is made to the signature page of the registration statement filed by the Registrant on September 18, 2019).</u></a>

+ Indicates management contract or compensatory plan.

# Confidential treatment has been requested with respect to certain portions of this exhibit. Omitted portions have been filed separately with the SEC.

† Previously filed.

- (1) Incorporated by reference to the Registrant's Current Report on Form 8-K, filed with the SEC on August 24, 2018.
- (2) Incorporated by reference to the Registrant's Registration Statement on Form S-1 (File No. 333-225970), as amended.
- (3) Incorporated by reference to the Registrant's Current Report on Form 8-K, filed with the SEC on November 21, 2018.
- (4) Incorporated by reference to the Registrant's Current Report on Form 8-K, filed with the SEC on March 14, 2019.
- (5) Incorporated by reference to the Registrant's Registration Statement on Form S-8 (File No. 333-227073).
- (6) Incorporated by reference to the Registrant's Quarterly Report on Form 10-Q, filed with the SEC on August 8, 2019.

### **(b) Financial Statement Schedules**

No financial statement schedules are provided because the information called for is not required or is shown either in the financial statements or related notes, which are incorporated herein by reference.

**Item 17. Undertakings**

The undersigned registrant hereby undertakes to provide to the underwriters at the closing specified in the underwriting agreement certificates in such denominations and registered in such names as required by the underwriters to permit prompt delivery to each purchaser.

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the registrant pursuant to the foregoing provisions, or otherwise, the registrant has been advised that in the opinion of the 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 of whether such indemnification by it is against public policy as expressed in the Securities Act and will be governed by the final adjudication of such issue.

The undersigned registrant hereby undertakes:

- (1) To file, during any period in which offers or sales are being made, a post-effective amendment to this registration statement:
  - (i) to include any prospectus required by Section 10(a)(3) of the Securities Act of 1933;
  - (ii) to reflect in the prospectus any facts or events arising after the effective date of the registration statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in the registration statement. Notwithstanding the foregoing, any increase or decrease in volume of securities offered (if the total dollar value of securities offered would not exceed that which was registered) and any deviation from the low or high end of the estimated maximum offering range may be reflected in the form of prospectus filed with the Commission pursuant to Rule 424(b) if, in the aggregate, the changes in volume and price represent no more than a 20% change in the maximum aggregate offering price set forth in the "Calculation of Registration Fee" table in the effective registration statement; and
  - (iii) to include any material information with respect to the plan of distribution not previously disclosed in the registration statement or any material change to such information in the registration statement.
- (2) That, for the purpose of determining any liability under the Securities Act of 1933, each such post-effective amendment shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.
- (3) To remove from registration by means of a post-effective amendment any of the securities being registered which remain unsold at the termination of the offering.
- (4) That, for the purpose of determining liability under the Securities Act of 1933 to any purchaser in the initial distribution of the securities, the undersigned registrant undertakes that in a primary offering of securities of the undersigned registrant pursuant to this registration statement, regardless of the underwriting method used to sell the securities to the purchaser, if the securities are offered or sold to such purchaser by means of any of the following communications, the undersigned registrant will be a seller to the purchaser and will be considered to offer or sell such securities to such purchaser:
  - (i) Any preliminary prospectus or prospectus of the undersigned registrant relating to the offering required to be filed pursuant to Rule 424 (§230.424 of this chapter);
  - (ii) Any free writing prospectus relating to the offering prepared by or on behalf of the undersigned registrant or used or referred to by the undersigned registrant;
  - (iii) The portion of any other free writing prospectus relating to the offering containing material information about the undersigned registrant or its securities provided by or on behalf of the undersigned registrant; and
  - (iv) Any other communication that is an offer in the offering made by the undersigned registrant to the purchaser.



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- (5) The undersigned registrant hereby undertakes that, for purposes of determining any liability under the Securities Act, each filing of the registrant's annual report pursuant to section 13(a) or section 15(d) of the Securities Exchange Act of 1934, as amended, or the Exchange Act, (and, where applicable, each filing of an employee benefit plan's annual report pursuant to section 15(d) of the Exchange Act) that is incorporated by reference in the registration statement shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.
- (6) For purposes of determining any liability under the Securities Act, the information omitted from the form of prospectus filed as part of this Registration Statement in reliance upon Rule 430A and contained in a form of prospectus filed by the Registrant pursuant to Rule 424(b)(1) or (4) or 497(h) under the Securities Act shall be deemed to be part of this Registration Statement as of the time it was declared effective.
- (7) For the purpose of determining any liability under the Securities Act, each post-effective amendment that contains a form of prospectus shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

**SIGNATURES**

Pursuant to the requirements of the Securities Act of 1933, the Registrant has duly caused this Amendment No. 1 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 October 17, 2019.

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 of 1933, this Amendment No. 1 to the Registration Statement has been signed by the following persons in the capacities indicated on the dates indicated.

<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ R. Erik Holmlin, Ph.D.</u> R. Erik Holmlin, Ph.D.	Chief Executive Officer and Director <i>(Principal Executive Officer)</i>	October 17, 2019
<u>/s/ Mike Ward</u> Mike Ward	Chief Financial Officer <i>(Principal Financial and Accounting Officer)</i>	October 17, 2019
<u>/s/ David L. Barker, Ph.D.*</u> David L. Barker, Ph.D.	Director	October 17, 2019
<u>/s/ Albert A. Luderer, Ph.D.*</u> Albert A. Luderer, Ph.D.	Director	October 17, 2019
<u>/s/ Junfeng Wang*</u> Junfeng Wang	Director	October 17, 2019
<u>/s/ Christopher Tworney*</u> Christopher Twomey	Director	October 17, 2019
<u>/s/ Kristina Vuori, M.D., Ph.D.*</u> Kristiina Vuori, M.D., Ph.D.	Director	October 17, 2019
<u>/s/ Quan Zhou*</u> Quan Zhou	Director	October 17, 2019

\* Pursuant to power of attorney

By: /s/ R. Erik Holmlin, Ph.D.\*  
R. Erik Holmlin, Ph.D.  
*Attorney-in-Fact*

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\_\_\_\_ Shares of Common Stock (or Pre-Funded Warrants to Purchase Shares of Common Stock in Lieu Thereof)

Warrants to Purchase \_\_\_\_ Shares of Common Stock

BIONANO GENOMICS, INC.

**UNDERWRITING AGREEMENT**

October \_\_\_\_, 2019

Oppenheimer & Co. Inc.  
as Representative of the several  
Underwriters named on Schedule I hereto

c/o Oppenheimer & Co. Inc.  
85 Broad Street  
New York, New York 10004

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 Oppenheimer & Co. Inc., as representative (the “Representative”) of the several underwriters named in Schedule I hereto (each, an “Underwriter” and collectively, the “Underwriters”), (i) an aggregate of \_\_\_\_ authorized but unissued shares (the “Shares”) of common stock, par value \$0.0001 per share, of the Company (the “Common Stock”) or pre-funded warrants (the “Pre-Funded Warrants”) to purchase Common Stock in lieu thereof at an exercise price of \$0.001 per share (the “Pre-Funded Warrant Shares”), and (ii) warrants (the “Warrants”) to purchase up to an aggregate of \_\_\_\_ shares of Common Stock (the “Warrant Shares”). The Shares, Warrants, the Pre-Funded Warrants, the Warrant Shares and the Pre-Funded Warrant Shares are collectively referred to as the “Securities.”

The Shares and/or Pre-Funded Warrants and Warrants shall be sold together as a fixed combination, each consisting of one share of Common Stock and/or Pre-Funded Warrant and one Warrant to purchase one share of Common Stock, having an exercise term of \_\_\_\_ ( ) years. The Shares and/or Pre-Funded Warrants and the Warrants shall be issued separately and shall be immediately separable and transferable upon issuance. The terms of the Warrants are set forth in the form of Warrant attached hereto as **Exhibit A**. The terms of the Pre-Funded Warrants are set forth in the form of Pre-Funded Warrant attached hereto as **Exhibit B**.

The Company and the 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 on Form S-1 (File No. 333-[\_\_\_\_]), including the related preliminary prospectus or prospectuses, covering the registration of the sale of the Securities under the Securities Act of 1933, as amended (the “Securities Act”), and the rules and regulations of the Commission thereunder (the “Rules and Regulations”). Promptly after execution and delivery of this Agreement, the Company will prepare and file a prospectus in accordance with the provisions of Rule 430A (“Rule 430A”) of the Rules and Regulations and Rule 424(b) (“Rule 424(b)”) of the Rules and Regulations. The information included in such prospectus that was omitted from such registration statement at the time it became effective but that is deemed to be part of such registration statement at the time it became effective pursuant to Rule 430A(b) is herein called the “Rule 430A Information.” Such registration statement, including the amendments thereto, the exhibits thereto and any schedules thereto, at the time it became effective, and including the Rule 430A Information, is herein called the “Registration Statement.” Any registration statement filed pursuant to Rule 462(b) of the Rules and Regulations is herein called the “Rule 462(b) Registration Statement” and, after such filing, the term “Registration Statement” shall include the Rule 462(b) Registration Statement. Each prospectus used prior to the effectiveness of the Registration Statement (such time, the “Effective Time”), and each prospectus that omitted the Rule 430A Information that was used after such effectiveness and prior to the execution and delivery of this Agreement is herein called a “preliminary prospectus.” The final prospectus relating to the Securities that is first filed pursuant to Rule 424(b), in the form first furnished to the Underwriters for use in connection with the offering of the Securities, is herein called the “Prospectus.” For purposes of this Agreement, all references to the Registration Statement, any preliminary prospectus, the Prospectus or any amendment or supplement to any of the foregoing shall be deemed to include the copy filed with the Commission pursuant to its Electronic Data Gathering, Analysis and Retrieval system or any successor system (“EDGAR”).

All references in this Agreement to financial statements and schedules and other information which is “described,” “contained,” “included” or “stated” in the Registration Statement or the Prospectus (or other references of like import) shall be deemed to mean and include all such financial statements, pro forma financial information and schedules and other information which is incorporated by reference in or otherwise deemed by the Rules and Regulations to be a part of or included in the Registration Statement or the Prospectus, as the case may be; and all references in this Agreement to amendments or supplements to the Registration Statement or the Prospectus shall be deemed to mean and include the subsequent filing of any document under the Securities Exchange Act of 1934, as amended (the “Exchange Act”), that is deemed to be incorporated therein by reference or otherwise deemed by the Rules and Regulations to be a part thereof.

**2. Representations and Warranties of the Company Regarding the Offering.**

(a) The Company represents and warrants to, and agrees with, the Representative, as of the date hereof and as of the Closing Date (as defined in Section 4(c) below) as follows:

(i) **No Material Misstatements or Omissions.** At the Effective Time, at the date hereof and, at the Closing Date, the Registration Statement and any post-effective amendment, at the time of filing thereof, conformed or will conform 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 below), as of [ ] (Eastern time) on the date hereof (the “Applicable Time”), on the Closing Date, if any, and the Prospectus, as amended or supplemented, as of its date, at the time of filing pursuant to Rule 424(b) under the Securities Act and at the Closing Date, and any individual Written Testing-the-Waters Communication (as defined below), when considered together with the Time of Sale Disclosure Package, did not or will 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 Underwriter, which the Company acknowledges is limited to the information contained in the \_\_\_ paragraphs under the caption “Underwriting” in each of the preliminary prospectus and the Prospectus related to the compensation of the Underwriters and the stabilization activities of the Underwriters (collectively, the “Underwriters’ Information”). 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 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 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 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 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 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 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 Securities, if any. 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 Prospectus, no Issuer Free Writing Prospectus, as of the 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 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 Prospectus or any Issuer Free Writing Prospectus in reliance upon, and in conformity with, the Underwriters’ Information. As used in this paragraph and elsewhere in this Agreement:

A. “Time of Sale Disclosure Package” means the most recent preliminary prospectus that is distributed to investors prior to the time of effectiveness, each Issuer Free Writing Prospectus, and the description of the transaction provided by the Underwriters included on Schedule II hereto.

B. “Issuer Free Writing Prospectus” means any “issuer free writing prospectus,” as defined in Rule 433 under the Securities Act, relating to the 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. For the avoidance of doubt, the term “Issuer Free Writing Prospectus” shall not include any “free writing prospectus” (as defined in Rule 405 under the Securities Act) that was prepared by any Underwriter or provided to any person by any Underwriter without the knowledge and consent of the Company.

(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 or incorporated by reference in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus, comply in all material respects with the applicable requirements of the Securities Act and 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 Prospectus.

(vii) **Independent Accountants.** To the Company’s knowledge, Deloitte & Touche LLP, which has expressed its opinion with respect to the financial statements included or incorporated by reference as part of the Registration Statement, the Time of Sale Disclosure Package and the 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 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 or incorporated by reference in the Registration Statement, the Time of Sale Disclosure Package, the 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 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 Prospectus, to the extent required, other than such consents the failure of which to obtain is not reasonably likely to result in a Material Adverse Effect.

(xi) **Trading Market.** The Common Stock is registered pursuant to Section 12(b) of the Exchange Act and is approved for listing on The Nasdaq Capital Market (“Nasdaq”). As of the Closing Date, the Shares, the Pre-Funded Warrant Shares and the Warrant Shares will have been duly authorized for listing on 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 Securities.

(xiii) **Investment Company Act.** The Company is not and, after giving effect to the offering and sale of the 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 IV 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 Schedule III (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 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 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 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 from any officer of the Company and delivered to the Representative or to the Representative’s counsel shall be deemed a representation and warranty by the Company to the Underwriters as to the matters covered thereby.



3. **Representations and Warranties of the Company Regarding the Company.**

(a) The Company represents and warrants to, and agrees with, the Representative, as of the date hereof and as of the Closing Date, 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 and execute the Pre-Funded Warrants and the Warrants and to authorize, issue and sell the Securities as contemplated by this Agreement. This Agreement has been duly authorized, executed and delivered by the Company, and together with the Pre-Funded Warrants and the Warrants, 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 by the Company 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 or the issue and sale of the Securities, except (A) the registration under the Securities Act of the Securities, which has been effected, (B) the necessary filings and approvals from Nasdaq to list the Shares, the Pre-Funded Warrant Shares and the 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 Shares and/or Pre-Funded Warrants and Warrants and distribution of the 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) **SEC Reports.** The Company is subject to and in compliance in all material respects with the reporting requirements of Section 13 or Section 15(d) of the Exchange Act, and has timely filed all reports required to be filed pursuant to Sections 13(a), 13(e), 14 and 15(d) of the Exchange Act (the "SEC Reports") during the preceding twelve (12) months.

(vii) **Capitalization.** The Company has an authorized capitalization as set forth in the Registration Statement, the Time of Sale Disclosure Package and the 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 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 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 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 Shares, the Pre-Funded Warrants and the Warrants, 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 Pre-Funded Warrant Shares and the Warrant Shares, when issued, paid for and delivered upon due exercise of the Pre-Funded Warrants and the Warrants, as applicable, 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.

(viii) **No Registration Rights.** Except as described in the Registration Statement, the Time of Sale Disclosure Package and the 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 Shares, the Pre-Funded Warrant Shares and the Warrant Shares 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.

(ix) **No Preemptive Rights.** Except as otherwise stated in the Registration Statement, in the Time of Sale Disclosure Package and in the Prospectus, there are no preemptive rights or other rights to subscribe for or to purchase, or any restrictions upon the voting or transfer of, any shares of Common Stock pursuant to the Company's certificate of incorporation, by-laws or any agreement or other instrument to which the Company or any of its subsidiaries is a party or by which the Company or any of its subsidiaries is bound.

(x) **Stock Options.** The exercise price of each option issued under the Company's stock option or other employee benefit plans has been no less than the fair market value of a share of common stock as determined on the date of grant of such option. All grants of options were validly issued and properly approved by the Board of Directors of the Company (or a duly authorized committee thereof) (the "**Board**") in material compliance with all applicable laws and regulations and recorded in the Company's financial statements in accordance with GAAP and, to the Company's knowledge, no such grants involved "back dating," "forward dating" or similar practice with respect to the effective date of grant.

(xi) **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 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.

(xii) **Material Change.** Since the respective dates as of which information is given in the Registration Statement, the Time of Sale Disclosure Package or the 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.

(xiii) **Ownership Interest.** Except as otherwise stated in the Registration Statement, in the Time of Sale Disclosure Package, the Preliminary Prospectus and the Prospectus, the Company does not own, directly or indirectly, any capital stock or other ownership interest in any partnership, corporation, business trust, limited liability company, limited liability partnership, joint stock company, trust, unincorporated association, joint venture or other entity.

(xiv) **Absence of Proceedings.** Other than as set forth in the Registration Statement, the Time of Sale Disclosure Package, the Preliminary Prospectus and the 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.

(xv) **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.

(xvi) **Compliance** Except as described in the Registration Statement, the Time of Sale Disclosure Package and the 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 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).

(xvii) **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 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 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.

(xviii) **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 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 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 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 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.

(xix) **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.

(xx) **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.

(xxi) **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

(xxii) **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.

(xxiii) **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).

(xxiv) **Accounting Controls and Disclosure Controls.** Except as disclosed in the Registration Statement, the Time of Sale Disclosure Package and the 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 Prospectus, since the end of the Company’s most recent audited fiscal year, there has been (X) no material weakness in the Company’s internal control over financial reporting (whether or not remediated) and (Y) 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.

(xxv) **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.

(xxvi) **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.



(xxvii) **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 Shares 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.

(xxviii) **Liquidity.** There are no transactions, arrangements or other relationships between and/or among the Company, any of its affiliates (as such term is defined in Rule 405 of the Rules and Regulations) and any unconsolidated entity, including, but not limited to, any structured finance, special purpose or limited purpose entity that would reasonably be expected to materially affect the Company’s liquidity or the availability of or requirements for its capital resources required to be described in the Time of Sale Disclosure Package and the Prospectus which have not been described as required.

(xxix) **Audit Committee.** The Board has validly appointed an audit committee whose composition satisfies the requirements of Rule 5605 of the Nasdaq Stock Market and the Board and/or the audit committee has adopted a charter that satisfies the requirements of Rule 5605 of the Nasdaq Stock Market. The audit committee has reviewed the adequacy of its charter within the past twelve months.

(xxx) **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 Prospectus. All material transactions by the Company with office holders or control persons of the Company have been duly approved by the Board, or duly appointed committees or officers thereof, if and to the extent required under U.S. law.

(xxxi) **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.

(xxxii) **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.

(xxxiii) **Transactions Affecting Disclosure to FINRA.**

A. **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 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. The Company is not a party to any other contract, agreement or understanding with any person that would give rise to a valid claim against the Company or the Underwriters for a brokerage commission, finder's fee or like payment in connection with the offering and sale of the Securities or any transaction contemplated by this Agreement, the Registration Statement, the Time of Sale Disclosure Package or the Prospectus.

B. **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: (1) 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; (2) any FINRA member; or (3) 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.

C. **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.

D. **No FINRA Affiliations.** Except as disclosed to the Representative in writing, there is no: (1) officer or director of the Company or its subsidiaries, (2) beneficial owner of 5% or more of any class of the Company's securities or (3) 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 (1), (2) or (3) of the immediately preceding sentence is or becomes an affiliate or associated person of a FINRA member participating in the public offering contemplated hereunder.

(xxxiv) **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.

(xxxv) **Investment Company.** The Company is not, and, after giving effect to the offering and sale of the Securities and the application of the net proceeds thereof, including the proceeds received upon exercise of the Pre-Funded Warrants and/or the Warrants, will not be required to register as an “investment company,” as such term is defined in the Investment Company Act of 1940, as amended.

(xxxvi) **Public Filings.** The Registration Statement (and any further documents to be filed with the Commission in connection with the offering) contains all exhibits and schedules as required by the Securities Act. Each of the Registration Statement and any post-effective amendment thereto, if any, at the time it became effective, complied in all material respects with the Securities Act and the applicable rules and regulations under the Securities Act and did not and, as amended or supplemented, if applicable, will 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 Prospectus complies in all material respects with the Securities Act and the applicable rules and regulations. The Prospectus, as amended or supplemented, did not and will not contain as of the date thereof any untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in light of the circumstances under which they were made, not misleading. The SEC Reports, when they respectively were filed with the Commission, conformed in all material respects to the requirements of the Securities Act and the Exchange Act, as applicable, and the applicable rules and regulations, and none of such documents, when they respectively were filed with the Commission, contained any untrue statement of a material fact or omitted to state a material fact necessary to make the statements therein (with respect to the SEC Reports incorporated by reference in the Prospectus), in light of the circumstances under which they were made not misleading; and any further documents so filed and incorporated by reference in the Prospectus when such documents are filed with the Commission, will conform in all material respects to the requirements of the Exchange Act and the applicable rules and regulations, as applicable, and will not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements therein, in light of the circumstances under which they were made not misleading. No post-effective amendment to the Registration Statement reflecting any facts or events arising after the date thereof which represent, individually or in the aggregate, a fundamental change in the information set forth therein is required to be filed with the Commission. There are no documents required to be filed with the Commission in connection with the transaction contemplated hereby that (A) have not been filed as required pursuant to the Securities Act or (B) will not be filed within the requisite time period. There are no contracts or other documents required to be described in the Prospectus, or to be filed as exhibits or schedules to the Registration Statement, which have not been described or filed as required.

(xxxvii) **No Prior Offering Integration.** The Company has not, directly or indirectly, made any offers or sales of any security or solicited any offers to buy any security, under circumstances that would cause this offering of the Securities to be integrated with prior offerings by the Company for purposes of any applicable shareholder approval provisions of any trading market on which any of the securities of the Company are listed or designated.

(xxxviii) **No Off-Balance Sheet Arrangements.** Except as set forth in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus, there are no material off-balance sheet arrangements (as defined in Item 303 of Regulation S-K) that have or are reasonably likely to have a material current or future effect on the Company's financial condition, revenues or expenses, changes in financial condition, results of operations, liquidity, capital expenditures or capital resources.

(xxxix) **Certain Statements.** The statements set forth in the Registration Statement, the Time of Sale Disclosure Package and the 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 Shares, and (C) the terms of the documents referred to therein, are accurate and fair in all material respects.

(xl) **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 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.

#### **4. Purchase, Sale and Delivery of Securities.**

(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 Shares and/or Pre-Funded Warrants and Warrants to the Underwriters, and the Underwriters, severally and not jointly, agree to purchase the Shares and/or Pre-Funded Warrants and the Warrants. The purchase price for one Share and one Warrant to purchase one share of Common Stock shall be \$\_\_\_\_\_ (the "Share and Warrant Purchase Price"), and the purchase price for one Pre-Funded Warrant and one Warrant to purchase one share of Common Stock shall be \$\_\_\_\_\_ (the "Pre-Funded Warrant and Warrant Purchase Price").

(b) Prior to the Closing Date, the Representative shall provide the Company with a list of investors to which the Underwriters allocated Pre-Funded Warrants and Warrants, as applicable (the "Investor List"). The Investor List shall specify the name, address and number of Pre-Funded Warrants and Warrants to be sold to each such investor. Prior to the Closing Date, the Company shall provide a draft of the Pre-Funded Warrants and Warrants, as applicable, to the Representative for review. On the Closing Date, the Company shall deliver the Pre-Funded Warrants and Warrants, as applicable, by mailing such instruments to each investor in accordance with the Investor List through a U.S. nationally recognized overnight courier service. If the Company, upon the instruction of the Representative, registers any Pre-Funded Warrant or Warrant in the name of any person or entity to which any Underwriter intends to sell such Pre-Funded Warrant or Warrant, then such Underwriter shall have the right to thereafter, but prior to the Closing Date, request the re-registration of such Pre-Funded Warrant or Warrant (and the Company shall be required to re-register such Pre-Funded Warrant or Warrant) in the name of any other person or entity (it being understood that such re-registration is intended to permit an Underwriter to resell such Pre-Funded Warrant or Warrant in the event that the person or entity to which such Underwriter originally intended to sell such Pre-Funded Warrant or Warrant shall fail to pay the purchase price of such Pre-Funded Warrant or Warrant).

(c) The Shares and/or Pre-Funded Warrants and Warrants will be delivered by the Company to the Underwriters (or as otherwise provided for in Section 4(b) above) against payment of the Share and Warrant Purchase Price or the Pre-Funded Warrant and Warrant Purchase Price, as applicable, by wire transfer of same day funds payable to the order of the Company at the offices of Oppenheimer & Co. Inc., 85 Broad Street, New York, New York 10004, or such other location as may be mutually acceptable, at \_\_ [a.m.]/[p.m.] Eastern Time, on the second (or if the Shares and/or Pre-Funded Warrants and Warrants are priced, as contemplated by Rule 15c6-1(c) under the Exchange Act, after 4:30 p.m. Eastern time, the third) 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. The time and date of delivery of the Shares and/or Pre-Funded Warrants and Warrants is referred to herein as the "Closing Date." Delivery of the Shares shall be made through the facilities of the Depositary Trust Company designated by the Representative. Delivery of the Pre-Funded Warrants and Warrants shall be made by physical delivery to be received or directed by the Underwriters no later than one (1) business day following the Closing Date.

5. **Covenants.**

(a) The Company covenants and agrees with the Representative as follows:

(i) The Company shall prepare the Prospectus in a form approved by the Underwriters and file such 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 of the Commission.

(ii) During the period beginning on the date hereof and ending on the earlier of (A) such date as determined by the Representative that the Prospectus is no longer required by law to be delivered in connection with sales by an underwriter or dealer or (B) the completion of the distribution of the Securities by the Underwriters (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 Prospectus, the Company shall furnish to the Representative 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 Representative reasonably objects.

(iii) From the date of this Agreement until the end of the Prospectus Delivery Period, the Company shall promptly advise the Representative in writing (A) of the receipt of any comments of, or requests for additional or supplemental information from, the Commission, (B) 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 Prospectus or any Issuer Free Writing Prospectus, (C) of the time and date that any post-effective amendment to the Registration Statement becomes effective and (D) 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 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 during the Prospectus Delivery Period that it shall comply with the provisions of Rules 424(b), 430A and 430B, as applicable, under the Securities Act 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).

(iv) (A) 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 Securities as contemplated by the provisions hereof, the Time of Sale Disclosure Package, the Registration Statement and the Prospectus. If during the Prospectus Delivery Period any event occurs as the result of which would cause the Prospectus (or if the 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 under which such statement was made, not misleading, or if during such period it is necessary or appropriate in the opinion of the Company or its counsel or the Underwriters or their counsel to amend the Registration Statement or supplement the Prospectus (or if the Prospectus is not yet available to prospective purchasers, the Time of Sale Disclosure Package ) to comply with the Securities Act or to file under the Exchange Act any document that would be deemed to be incorporated by reference in the Prospectus in order to comply with the Securities Act or the Exchange Act, the Company will promptly notify the Underwriters, allow the Underwriters the opportunity to provide reasonable comments on such amendment, Prospectus or document, and will amend the Registration Statement or supplement the Prospectus (or if the 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.

(B) During the Prospectus Delivery Period, if at any time following the issuance of an Issuer Free Writing Prospectus there occurred or occurs an event or development the result of which is that 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 has promptly notified or promptly will notify the Underwriters and has promptly amended or will promptly amend or supplement, at its own expense, such Issuer Free Writing Prospectus to eliminate or correct such conflict, untrue statement or omission.

(v) The Company shall take or cause to be taken all necessary action to qualify the Securities 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 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.

(vi) The Company shall deliver to the Underwriters and counsel for the Underwriters copies, without charge, of the Registration Statement, the Prospectus, any Issuer Free Writing Prospectus, and all amendments and supplements to such documents, and signed copies of all consents and certificates of experts, in each case as soon as available and in such quantities as the Underwriters may from time to time reasonably request.

(vii) The Company will make generally available to its security holders as soon as practicable, but in any event not later than 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.

(viii) The Company shall use commercially reasonable efforts to maintain the listing of the Shares of Common Stock on Nasdaq for at least two (2) years from the date of this Agreement unless the Company is acquired or goes private under Exchange Act Rule 13e-3 during such time.

(ix) For a period of two (2) years from the Closing Date, the Company shall use its commercially reasonable efforts to maintain the registration of the Shares and, when issued, the Pre-Funded Warrant Shares and Warrant Shares under the Exchange Act unless the Company is acquired or goes private under Exchange Act Rule 13e-3 during such time.

(x) For so long as any Pre-Funded Warrants or Warrants remain outstanding, the Company shall continue to reserve and keep available at all times, free of preemptive rights, a sufficient number of authorized shares of Common Stock for the purpose of enabling the Company to effect the issuance of the Pre-Funded Warrant Shares and Warrant Shares, as applicable.

(xi) The Company, whether or not the transactions contemplated hereunder are consummated or this Agreement is terminated, will pay or cause to be paid (A) all expenses incurred in connection with the delivery to the Underwriters of the Securities (including transfer taxes allocated to the respective transferees, all fees and expenses of the registrar and transfer agent of the Securities (if other than the Company) and the cost of preparing and printing warrant certificates), (B) 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 Securities, the Time of Sale Disclosure Package, any Prospectus, any Issuer Free Writing Prospectus and any amendment thereof or supplement thereto, (C) all reasonable filing fees and reasonable fees and disbursements of the Representative's counsel incurred in connection with the qualification of the Securities for offering and sale by the Underwriters or by dealers under the securities or blue sky laws of the states and other jurisdictions that the Underwriters shall designate, (D) the fees and expenses of any transfer agent or registrar (E) the reasonable filing fees and reasonable fees and disbursements of Representative's counsel incident to any required review and approval by FINRA, of the terms of the sale of the Securities, (F) all fees and expenses relating to the listing of the Securities on Nasdaq, (G) the fees and expenses of the Company's accountants, (H) the costs and expenses of any Testing-the-Waters Communications, (I) the costs and expenses of the Company relating to investor presentations on any "road show" undertaken in connection with the marketing of the Shares, 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 (J) 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 its reasonable and documented out-of-pocket expenses incurred in connection with the offer and sale of the Securities contemplated hereby, including the fees and disbursements of its counsel, in an aggregate amount not to exceed \$100,000 without the Company's prior approval (such approval not to be unreasonably withheld, conditioned or delayed).

(xii) The Company intends to apply the net proceeds from the sale of the Securities to be sold by it hereunder for the purposes set forth in the Time of Sale Disclosure Package and in the Prospectus.

(xiii) The Company has not taken and will not take, directly or indirectly, during the Prospectus Delivery Period, 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 Securities.

(xiv) The Company represents and agrees that, unless it obtains the prior written consent of the Representative, and the Representative 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 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 II. Any such free writing prospectus set forth on Schedule II 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.

(xv) The Company hereby agrees that, without the prior written consent of the Representative, it will not, during the period ending 90 days after the date hereof ("Lock-Up Period"), (A) sell, offer to sell, contract or agree to sell, hypothecate, pledge, grant any option to purchase or otherwise dispose of or agree to dispose of, directly or indirectly, or file (or participate in the filing of) a registration statement with the Commission in respect of, or establish or increase a put equivalent position or liquidate or decrease a call equivalent position within the meaning of Section 16 of the Exchange Act with respect to, any Common Stock or any other securities of the Company that are substantially similar to Common Stock, or any securities convertible into or exchangeable or exercisable for, or any warrants or other rights to purchase, the foregoing, (B) enter into any swap or other arrangement that transfers to another, in whole or in part, any of the economic consequences of ownership of Common Stock or any other securities of the Company that are substantially similar to Common Stock, or any securities convertible into or exchangeable or exercisable for, or any warrants or other rights to purchase, the foregoing, whether any such transaction is to be settled by delivery of Common Stock or such other securities, in cash or otherwise or (C) publicly announce an intention to effect any transaction specified in clause (A) or (B). The restrictions contained in the preceding sentence shall not apply to (W) the Securities to be sold hereunder, (X) the issuance of Common Stock upon the exercise of options or warrants disclosed as outstanding in the Registration Statement (excluding exhibits thereto), the Time of Sale Disclosure Package or the Prospectus, (Y) the issuance of employee stock options not exercisable during the Lock-Up Period and the grant of restricted stock awards or restricted stock units pursuant to equity incentive plans described in the Registration Statement (excluding exhibits thereto) and the Prospectus or (Z) the filing of registration statements on Form S-8 with respect to the shares of Common Stock reserved for issuance under the Company's equity incentive plans as in effect from time to time.



(xvi) Prior to the Closing Date, the Company will issue no press release or other communications directly or indirectly and hold no press conference with respect to the Company, the condition, financial or otherwise, or the earnings, business affairs or business prospects of any of them, or the offering of the Securities without the prior written consent of the Representatives unless in the judgment of the Company and its counsel, and after notification to the Representatives, such press release or communication is required by law.

(xvii) The Company hereby agrees to engage and maintain, at its expense, a registrar and transfer agent for the Securities.

(xviii) 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 (A) the end of the Prospectus Delivery Period and (B) the expiration of the Lock-Up Period described above.

**6. Conditions of the Underwriters' Obligations.** The obligations of each Underwriter hereunder to purchase the Securities are subject to the accuracy, as of the date hereof and at the Closing Date (as if made at the Closing Date), 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 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 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, the 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, the Prospectus, any Issuer Free Writing Prospectus or otherwise) shall have been complied with to the Underwriters' satisfaction.

(b) The Shares, the Pre-Funded Warrant Shares and Warrant Shares shall be qualified and approved for listing on Nasdaq.

(c) FINRA shall have raised no objection to the fairness and reasonableness of the underwriting terms and arrangements.

(d) The Representative shall not have reasonably determined, and advised the Company, that the Registration Statement, the Time of Sale Disclosure Package or the Prospectus, or any amendment thereof or supplement thereto, or any Issuer Free Writing Prospectus, contains an untrue statement of fact which, in the Representative's reasonable opinion, is material, or omits to state a fact which, in the Representative's reasonable opinion, is material and is required to be stated therein or necessary to make the statements therein not misleading

(e) Between the date hereof and the Closing Date (A) no downgrading shall have occurred in the rating accorded any of the Company's securities by any "nationally recognized statistical organization," as that term is defined by the Commission for purposes of Rule 436(g)(2) under the Securities Act, and (B) no such organization shall have publicly announced that it has under surveillance or review, with possible negative implications, its rating of any of the Company's securities.

(f) On the Closing Date, there shall have been furnished to the Representative the opinion and negative assurance letter of Cooley LLP, corporate counsel for the Company, dated as of the Closing Date and addressed to the Representative, in form and substance reasonably satisfactory to the Representative.

(g) On the Closing Date, there shall have been furnished to the Representative an opinion from each of Sheppard, Mullin, Richter & Hampton LLP and Riverside Law LLP, the Company's intellectual property counsel, dated as of the Closing Date and addressed to the Representative, in form and substance reasonably satisfactory to the Representative.

(h) On the Closing Date, there shall have been furnished to the Representative a negative assurance letter from Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., counsel to the Underwriters, dated as of the Closing Date and addressed to the Representative, in form and substance reasonably satisfactory to the Representative.

(i) The Representative shall have received a letter of Deloitte & Touche LLP, on the date hereof and on the Closing Date addressed to the Representative, confirming that they are independent public accountants within the meaning of the Securities Act and are 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 Time of Sale Disclosure Package, as of a date not prior to the date hereof or more than five days prior to the date of such letter), the conclusions and findings of said firm, of the type ordinarily included in accountants' "comfort letters" to underwriters, with respect to the financial information, including any financial information contained in Exchange Act Reports filed by the Company or incorporated by reference in the Registration Statement, the Time of Sale Disclosure Package and the Prospectus, and other matters required by the Representative.

(j) On the Closing Date, there shall have been furnished to the Representative a certificate, dated the Closing Date and addressed to the Representative, 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:

(i) The representations and warranties of the Company in this Agreement that are qualified by materiality or by reference to any Material Adverse Effect 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 the Company has complied with all the agreements and satisfied all the conditions on its part to be performed or satisfied at or prior to the Closing Date;

(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 Securities for offering or sale, or (C) suspending or preventing the use of the Time of Sale Disclosure Package, the 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; and

(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.

(k) On or before the date hereof, the Representative shall have received duly executed "lock-up" agreements, in the form attached hereto as Schedule III, between the Representative and each of the parties set forth on Schedule IV hereto.

(l) The Representative shall have received electronic copies of the Pre-Funded Warrants and/or Warrants executed by the Company.

(m) The Common Stock shall be registered under the Exchange Act and shall be listed on Nasdaq, and the Company shall not have taken any action designed to terminate, or likely to have the effect of terminating, the registration of the Common Stock under the Exchange Act or delisting or suspending from trading the Common Stock from Nasdaq, nor shall the Company have received any information suggesting that the Commission is contemplated terminating such registration or listing.

(n) The Company shall have furnished to the Representative and its counsel such additional documents, certificates and evidence as the Representative or its counsel may have reasonably requested.

(o) On the Closing Date, the Shares shall have been delivered via the Depository Trust Company system to the accounts of the Underwriters.

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 notice to the Company at any time at or prior to the Closing Date and such termination shall be without liability of any party to any other party, except that Section 5(a)(xi), 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 the Underwriters, their affiliates, directors and officers and employees, and each person, if any, who controls an Underwriter within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act, from and against any losses, claims, damages or liabilities to which the Underwriters 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 time of effectiveness 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, the Prospectus, or any amendment or supplement thereto (including any documents filed under the Exchange Act and deemed to be incorporated by reference into the Registration Statement or the Prospectus), or any Issuer Free Writing Prospectus or the Marketing Materials, 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 the Underwriters 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 (or any legal or other expense reasonably incurred in connection with the evaluation, investigation or defense thereof); *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, the Prospectus, or any amendment or supplement thereto or any Issuer Free Writing Prospectus, in reliance upon and in conformity with written information furnished to the Company by the Underwriters specifically for use in the preparation thereof, which written information is described in Section 7(f).

(b) The Underwriters 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, 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, the Prospectus, or any amendment or supplement thereto, any Issuer Free Writing Prospectus or any "issuer information" filed or required to be filed pursuant to Rule 433(d) under the Act, 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, the Prospectus, or any amendment or supplement thereto or any Issuer Free Writing Prospectus or any "issuer information" filed or required to be filed pursuant to Rule 433(d) under the Act in reliance upon and in conformity with written information furnished to the Company by the Representative by or behalf of any Underwriters specifically for use in the preparation thereof, and will reimburse the Company for any legal or other expenses reasonably incurred by the Company in connection with defending against any such loss, claim, damage, liability or action.

(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, it shall notify the indemnifying party of the commencement thereof, and 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 reasonably 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.

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 (a) 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 (b) does not include a statement as to or an admission of fault, culpability or a failure to act by or on behalf of any indemnified party.

(d) If the indemnification provided for in this Section 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 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 discounts and commissions received by the Underwriters, in each case as set forth in the table on the cover page of the Prospectus. The relative fault shall be determined by reference to, among other things, whether the untrue or alleged untrue statement of a material fact or the omission or alleged omission to state a material fact relates to information supplied by the Company 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 (d) 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 (d). 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 (d) 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 (d). Notwithstanding the provisions of this subsection (d), the Underwriters shall not be required to contribute any amount in excess of the amount of the Underwriters' discounts commissions set forth in the table on the cover of the Prospectus. 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.

(e) 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 person, if any, who controls the Underwriters within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act; and the obligations of the Underwriters under this Section 7 shall be in addition to any liability that the Underwriters may otherwise have and the benefits of such obligations shall extend, upon the same terms and conditions, to the Company, and officers, directors and each person who controls the Company within the meaning of Section 15 of the Securities Act or Section 20 of the Exchange Act.

(f) For purposes of this Agreement, the Underwriters confirm, and the Company acknowledges, that there is no information concerning the Underwriters furnished in writing to the Company by the Underwriters specifically for preparation of or inclusion in the Registration Statement, the Time of Sale Disclosure Package, the Prospectus or any Issuer Free Writing Prospectus, other than the statements set forth in the statements set forth in the “Underwriting” section of the Prospectus and Time of Sale Disclosure Package, only insofar as such statements relate to the amount of selling concession and re-allowance and related activities that may be undertaken by the Underwriters.

**8. Representations and Agreements to Survive Delivery.** All representations, warranties, and agreements of the Company herein or in certificates delivered pursuant hereto, including, but not limited to, the agreements of the Underwriters and the Company contained in Section 5(a)(xi) and Section 7 hereof, shall remain operative and in full force and effect regardless of any investigation made by or on behalf of the Underwriters or any controlling person thereof, or the Company or any of its officers, directors, or controlling persons, and shall survive delivery of, and payment for, the Securities to and by the Underwriters hereunder.

**9. Termination of this Agreement.**

(a) The Representative shall have the right to terminate this Agreement by giving notice to the Company as hereinafter specified at any time at or prior to the Closing Date, if in the 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 Shares or enforce contracts for the sale of the Shares (ii) trading in the Company’s Common Stock shall have been suspended by the Commission or Nasdaq or trading in securities generally on Nasdaq, the NYSE or NYSE MKT shall have been suspended, (iii) minimum or maximum prices for trading shall have been fixed, or maximum ranges for prices for securities shall have been required, on Nasdaq, 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 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, (vi) the Company suffers any loss by strike, fire, flood, earthquake, accident or other calamity, whether or not covered by insurance, or (vii) in the reasonable 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 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. Any such termination shall be without liability of any party to any other party except that the provisions of Section 5(a)(xi) and Section 7 hereof shall at all times be effective and shall survive such termination.

(b) If the Representative elects to terminate this Agreement as provided in this Section, the Company shall be notified promptly by the Representative by telephone, confirmed by letter.

**10. Notices.** Except as otherwise provided herein, all communications hereunder shall be in writing and, if to Representative, shall be mailed, delivered or telecopied to Oppenheimer & Co. Inc., 85 Broad Street, New York, NY 10004, Attention: Managing Director, with a copy to Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., 666 Third Avenue, New York, NY 10017, telecopy number: (212) 983-3115, Attention: Ivan K. Blumenthal; and if to the Company, shall be mailed, delivered or telecopied to it at 9640 Towne Centre Drive, Suite 100, San Diego, CA 92121, telecopy number: (858) 888-7601, Attention: R. Erik Holmlin, President and Chief Executive Officer, with a copy to Cooley LLP, 4401 Eastgate Mall, San Diego, CA 92121, telecopy number: (858) 550-6420, Attention: Thomas A. Coll; 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 parties to this Agreement written notice of a new address for such purpose.

**11. 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 Securities from the Underwriter.

**12. Absence of Fiduciary Relationship.** The Company acknowledges and agrees that: (a) the Underwriters have been retained solely to act as underwriter in connection with the sale of the Securities and that no fiduciary, advisory or agency relationship between the Company and the Underwriters has been created in respect of any of the transactions contemplated by this Agreement, irrespective of whether the Underwriters have advised or are advising the Company on other matters; (b) the price and other terms of the 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 the Underwriters have no obligation to disclose such interest and transactions to the Company by virtue of any fiduciary, advisory or agency relationship; (d) it has been advised that the Underwriters are acting, in respect of the transactions contemplated by this Agreement, solely for the benefit of the Underwriters, and not on behalf of the Company.



**13. Entire Agreement.** This Agreement represents the entire agreement of the parties and supersedes all prior or contemporaneous written or oral agreements between them concerning the offer and sale of the Securities.

**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 and the 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, AND THE PROSPECTUS.

**18. Counterparts.** This Agreement may be executed and delivered (including by facsimile transmission and electronic mail attaching a portable document file (.pdf)) 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.

*[Signature Page Follows]*

Please sign and return to the Company the enclosed duplicates of this Agreement whereupon this Agreement will become a binding agreement between the Company and the Representative in accordance with its terms.

Very truly yours,

BIONANO GENOMICS, INC.

By: \_\_\_\_\_  
Name: R. Erik Holmlin, Ph.D.  
Title: President and Chief Executive Officer

Confirmed as of the date first above-mentioned by the Representative.

OPPENHEIMER & CO. INC.  
as the Representative of the several  
Underwriters listed on Schedule I

By: \_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_

**SCHEDULE I**

	<u>Number of Shares</u>	<u>Number of Pre-Funded Warrants</u>	<u>Number of Warrants</u>
<b>Oppenheimer &amp; Co. Inc.</b>			
<b>Roth Capital Partners, LLC</b>			
<b>Maxim Group LLC</b>			
	<hr/>	<hr/>	<hr/>
Total	<hr/> <hr/>	<hr/> <hr/>	<hr/> <hr/>

**SCHEDULE II**

Free Writing Prospectus

**SCHEDULE III**

Form of Lock-Up Agreement

## SCHEDULE IV

### List of Lock-Up Parties

- David L. Barker, Ph.D.
- Mark Borodkin
- R. Erik Holmlin, Ph.D.
- Albert Luderer, Ph.D.
- Christopher Twomey
- Warren Robinson
- Mike Ward
- Junfeng Wang
- Quan Zhou
- Kristiina Vuori, M.D., Ph.D.

**Form of Warrant**

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## FORM OF WARRANT

BIONANO GENOMICS, INC.

## PRE-FUNDED WARRANT TO PURCHASE COMMON STOCK

Warrant No.: \_\_\_\_\_  
Number of Shares of Common Stock: \_\_\_\_\_  
Date of Issuance: [\_\_\_\_], 2019 (“**Issuance Date**”)

Bionano Genomics, Inc., a company organized under the laws of Delaware (the “**Company**”), hereby certifies that, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, [HOLDER], the registered holder hereof or its permitted assigns (the “**Holder**”), is entitled, subject to the terms set forth below, to purchase from the Company, at the Exercise Price (as defined below) then in effect, at any time or times on or after [\_\_\_\_] (the “**Initial Exercisability Date**”), until exercised in full (the “**Termination Date**”), \_\_\_\_\_ (\_\_\_\_\_) fully paid non-assessable shares of Common Stock (as defined below), subject to adjustment as provided herein (the “**Warrant Shares**”). Except as otherwise defined herein, capitalized terms in this Warrant to Purchase Common Stock (including any Pre-Funded Warrants to Purchase Common Stock issued in exchange, transfer or replacement hereof, this “**Warrant**”), shall have the meanings set forth in Section 16. This Warrant is one of the Pre-Funded Warrants to Purchase Common Stock (the “**Warrants**”) issued pursuant to (i) that certain Underwriting Agreement, dated as of [\_\_\_\_], 2019 (the “**Subscription Date**”) by and between the Company and Oppenheimer & Co. Inc., as representative of the several underwriters named therein, (ii) the Company’s Registration Statement on Form S-1 (File number 333-233828) (the “**Registration Statement**”) and (iii) the Company’s prospectus dated as of [\_\_\_\_], 2019.

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1. EXERCISE OF WARRANT.

(a) Mechanics of Exercise. Subject to the terms and conditions hereof (including, without limitation, the limitations set forth in Section 1(f)), this Warrant may be exercised by the Holder at any time or times on or after the Initial Exercisability Date, in whole or in part, by delivery (whether via facsimile, electronic mail or otherwise) of a written notice, in the form attached hereto as Exhibit A (the “**Exercise Notice**”), of the Holder's election to exercise this Warrant. Within one (1) Trading Day following the delivery of the Exercise Notice, the Holder shall make payment to the Company of an amount equal to the Exercise Price in effect on the date of such exercise multiplied by the number of Warrant Shares as to which this Warrant is being exercised (the “**Aggregate Exercise Price**”) in cash by wire transfer of immediately available funds or, if the provisions of Section 1(d) are applicable, by notifying the Company that this Warrant is being exercised pursuant to a Cashless Exercise (as defined in Section 1(d)). The Holder shall not be required to deliver the original Warrant in order to effect an exercise hereunder, nor shall any ink-original signature or medallion guarantee (or other type of guarantee or notarization) with respect to any Exercise Notice be required. Execution and delivery of the Exercise Notice with respect to less than all of the Warrant Shares shall have the same effect as cancellation of the original Warrant and issuance of a new Warrant evidencing the right to purchase the remaining number of Warrant Shares and the Holder shall not be required to physically surrender this Warrant to the Company until the Holder has purchased all of the Warrant Shares available hereunder and the Warrant has been exercised in full, in which case, the Holder shall surrender this Warrant to the Company for cancellation within three (3) Trading Days of the date on which the final Exercise Notice is delivered to the Company. On or before the first (1<sup>st</sup>) Trading Day following the date on which the Holder has delivered the applicable Exercise Notice, the Company shall transmit by facsimile or electronic mail an acknowledgment of confirmation of receipt of the Exercise Notice, in the form attached to the Exercise Notice, to the Holder and the Company's transfer agent (the “**Transfer Agent**”). So long as the Holder delivers the Aggregate Exercise Price (or notice of a Cashless Exercise, if applicable) on or prior to the first (1<sup>st</sup>) Trading Day following the date on which the Exercise Notice has been delivered to the Company, then on or prior to the earlier of (i) the second (2<sup>nd</sup>) Trading Day and (ii) the number of Trading Days comprising the Standard Settlement Period, in each case following the date on which the Exercise Notice has been delivered to the Company, or, if the Holder does not deliver the Aggregate Exercise Price (or notice of a Cashless Exercise, if applicable) on or prior to the first (1<sup>st</sup>) Trading Day following the date on which the Exercise Notice has been delivered to the Company, then on or prior to the first (1<sup>st</sup>) Trading Day following the date on which the Aggregate Exercise Price (or notice of a Cashless Exercise) is delivered (such earlier date, or if later, the earliest day on which the Company is required to deliver Warrant Shares pursuant to this Section 1(a), the “**Share Delivery Date**”), the Company shall (X) provided that the Transfer Agent is participating in The Depository Trust Company (“**DTC**”) Fast Automated Securities Transfer Program, credit such aggregate number of Warrant Shares 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 (Y) if the Transfer Agent is not participating in the DTC Fast Automated Securities Transfer Program, issue and dispatch by overnight courier to the physical address or email address as specified in the Exercise Notice, a certificate or evidence of a credit of book-entry shares, registered in the name of the Holder or its designee, for the number of Warrant Shares to which the Holder is entitled pursuant to such exercise. The Company shall be responsible for all fees and expenses of the Transfer Agent and all fees and expenses with respect to the issuance of Warrant Shares via DTC, if any, including without limitation for same day processing. Upon delivery of the Exercise Notice, the Holder shall be deemed for all corporate purposes to have become the holder of record and beneficial owner of the Warrant Shares with respect to which this Warrant has been exercised, irrespective of the date such Warrant Shares are credited to the Holder's DTC account or the date of delivery of the certificates evidencing such Warrant Shares, as the case may be. If this Warrant is physically delivered to the Company in connection with any exercise pursuant to this Section 1(a) and the number of Warrant Shares represented by this Warrant submitted for exercise is greater than the number of Warrant Shares being acquired upon an exercise, then the Company shall as soon as practicable and in no event later than three (3) Trading Days after any exercise and at its own expense, issue and deliver to the Holder (or its designee) a new Warrant (in accordance with Section 7(d)) representing the right to purchase the number of Warrant Shares issuable immediately prior to such exercise under this Warrant, less the number of Warrant Shares with respect to which this Warrant is exercised. No fractional Warrant Shares are to be issued upon the exercise of this Warrant, but rather the number of Warrant Shares to be issued shall be rounded down to the nearest whole number. The Company shall pay any and all transfer, stamp, issuance and similar taxes, costs and expenses (including, without limitation, fees and expenses of the Transfer Agent) which may be payable with respect to the issuance and delivery of Warrant Shares upon exercise of this Warrant. The Company's obligations to issue and deliver Warrant Shares in accordance with the terms and subject to the conditions 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; provided, however, that the Company shall not be required to deliver Warrant Shares with respect to an exercise prior to the Holder's delivery of the Aggregate Exercise Price (or notice of a Cashless Exercise) with respect to such exercise.

(b) **Exercise Price.** The aggregate exercise price of this Warrant, except for a nominal exercise price of \$0.001 per Warrant Share, was pre-funded to the Company on or prior to the Initial Exercise date and, consequently, no additional consideration (other than the nominal exercise price of \$0.001 per Warrant Share) shall be required to be paid by the Holder to any Person to effect any exercise of this Warrant. The Holder shall not be entitled to the return or refund of all, or any portion, of such pre-paid aggregate Exercise Price under any circumstance or for any reason whatsoever, including in the event this Warrant shall not have been exercised prior to the Termination Date. The exercise price per share of Common Stock under this Warrant shall be \$0.001, subject to adjustment hereunder (the “**Exercise Price**”).

(c) **Company's Failure to Timely Deliver Securities.** If either (I) the Company shall fail for any reason or for no reason to issue to the Holder on or prior to the applicable Share Delivery Date, if (x) the Transfer Agent is not participating in the DTC Fast Automated Securities Transfer Program, a certificate or evidence of a book-entry credit for the number of shares of Common Stock to which the Holder is entitled and register such Common Stock on the Company's share register or (y) the Transfer Agent is participating in the DTC Fast Automated Securities Transfer Program, to 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 this Warrant or (II) a registration statement (which may be the Registration Statement) covering the issuance or resale of the Warrant Shares that are the subject of the Exercise Notice (the “**Exercise Notice Warrant Shares**”) is not available for the issuance or resale, as applicable, of such Exercise Notice Warrant Shares and (x) the Company fails to promptly, but in no event later than one (1) Business Day after such registration statement becomes unavailable, to so notify the Holder and (y) the Company is unable to deliver the Exercise Notice Warrant Shares electronically without any restrictive legend by crediting such aggregate number of Exercise Notice Warrant Shares to the Holder's or its designee's balance account with DTC through its Deposit / Withdrawal At Custodian system (the event described in the immediately foregoing clause (II) is hereinafter referred to as a “**Notice Failure**” and together with the event described in clause (I) above, an “**Exercise Failure**”), then, in addition to all other remedies available to the Holder, if on or prior to the applicable Share Delivery Date either (I) if the Transfer Agent is not participating in the DTC Fast Automated Securities Transfer Program, the Company shall fail to issue and deliver a certificate or evidence of a book-entry credit to the Holder and register such shares of Common Stock on the Company's share register or, if the Transfer Agent is participating in the DTC Fast Automated Securities Transfer Program, credit the Holder's balance account with DTC for the number of shares of Common Stock to which the Holder is entitled upon the Holder's exercise hereunder or pursuant to the Company's obligation pursuant to clause (ii) below or (II) if a Notice Failure occurs, and if after such date the Holder is required by its broker to purchase (in an open market transaction or otherwise) or the Holder's brokerage firm otherwise purchases, shares of Common Stock to deliver in satisfaction of a sale by the Holder of the Warrant Shares which the Holder anticipated receiving upon such exercise (a “**Buy-In**”), then the Company shall (A) pay in cash to the Holder the amount, if any, by which (x) the Holder's total purchase price (including brokerage commissions, if any) for the shares of Common Stock so purchased exceeds (y) the amount obtained by multiplying (1) the number of Warrant Shares that the Company was required to deliver to the Holder in connection with the exercise at issue times (2) the price at which the sell order giving rise to such purchase obligation was executed, and (B) at the option of the Holder, either reinstate the portion of the Warrant and equivalent number of Warrant Shares for which such exercise was not honored (in which case such exercise shall be deemed rescinded) or deliver to the Holder the number of shares of Common Stock that would have been issued had the Company timely complied with its exercise and delivery obligations hereunder. For example, if the Holder purchases Common Stock having a total purchase price of \$11,000 to cover a Buy-In with respect to an attempted exercise of shares of Common Stock with an aggregate sale price giving rise to such purchase obligation of \$10,000, under clause (A) of the immediately preceding sentence the Company shall be required to pay the Holder \$1,000. The Holder shall provide the Company written notice indicating the amounts payable to the Holder in respect of the Buy-In and, upon request of the Company, evidence of the amount of such loss. 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 shares of Common Stock upon exercise of the Warrant as required pursuant to the terms hereof. The Company's current transfer agent participates in the DTC Fast Automated Securities Transfer Program (“**FAST**”). In the event that the Company changes transfer agents while this Warrant is outstanding, the Company shall use commercially reasonable efforts to select a transfer agent that participates in FAST. While this Warrant is outstanding, the Company shall request its transfer agent to participate in FAST with respect to this Warrant. In addition to the foregoing rights, (i) if the Company fails to deliver the applicable number of Warrant Shares upon an exercise pursuant to Section 1 by the applicable Share Delivery Date, then the Holder shall have the right to rescind such exercise in whole or in part and retain and/or have the Company return, as the case may be, any portion of this Warrant that has not been exercised pursuant to such Exercise Notice; provided that the rescission of an exercise shall not affect the Company's obligation to make any payments that have accrued prior to the date of such notice pursuant to this Section 1(c) or otherwise, and (ii) if a registration statement (which may be the Registration Statement) covering the issuance or resale of the Warrant Shares that are subject to an Exercise Notice is not available for the issuance or resale, as applicable, of such Exercise Notice Warrant Shares and the Holder has submitted an Exercise Notice prior to receiving notice of the non-availability of such registration statement and the Company has not already delivered the Warrant Shares underlying such Exercise Notice electronically without any restrictive legend by crediting such aggregate number of Warrant Shares 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, the Holder shall have the option, by delivery of notice to the Company, to (x) rescind such Exercise Notice in whole or in part and retain or have returned, as the case may be, any portion of this Warrant that has not been exercised pursuant to such Exercise Notice; provided that the rescission of an Exercise Notice shall not affect the Company's obligation to make any payments that have accrued prior to the date of such notice pursuant to this Section 1(c) or otherwise, and/or (y) switch some or all of such Exercise Notice from a cash exercise to a Cashless Exercise. In addition to the foregoing, if the Company fails for any reason to deliver to the Holder the Warrant Shares subject to an Exercise Notice by the second Trading Day following the Share Delivery Date, the Company shall pay to the Holder, in cash, as liquidated damages and not as a penalty, for each \$1,000 of Warrant Shares subject to such exercise (based on the Weighted Average Price of the Common Stock on the date of the applicable Exercise Notice), \$10 per Trading Day (increasing to \$20 per Trading Day on the fifth Trading Day after such liquidated damages

begin to accrue) for each Trading Day after the second Trading Day following such Share Delivery Date until such Warrant Shares are delivered or Holder rescinds such exercise.

(d) **Cashless Exercise.** Notwithstanding anything contained herein to the contrary, if a registration statement (which may be the Registration Statement) covering the issuance or resale of the Exercise Notice Warrant Shares is not available for the issuance or resale, as applicable, of such Exercise Notice Warrant Shares, the Holder may, in its sole discretion, exercise this 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 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 1(a) hereof on a day that is not a Trading Day or (2) both executed and delivered pursuant to Section 1(a) 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) at the option of the Holder, either (y) the Weighted Average Price on the Trading Day immediately preceding the date of the applicable Exercise Notice or (z) 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 and is delivered within two (2) hours thereafter (including until two (2) hours after the close of “regular trading hours” on a Trading Day) pursuant to Section 1(a) hereof or (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 1(a) hereof after the close of “regular trading hours” on such Trading Day.

C= \$0.001, as adjusted hereunder.

If Warrant Shares are issued in such a cashless exercise, the Company acknowledges and agrees that in accordance with Section 3(a)(9) of the Securities Act of 1933, as amended, the Warrant Shares shall take on the registered characteristics of the Warrants being exercised, and the holding period of the Warrants being exercised may be tacked on to the holding period of the Warrant Shares. The Company agrees not to take any position contrary to this Section 1(d). Without limiting the rights of a Holder to receive Warrant Shares on a “cashless exercise,” and to receive the cash payments contemplated pursuant to Sections 1(c) and 4(b), in no event will the Company be required to net cash settle a Warrant exercise.

(e) Disputes. In the case of a dispute as to the determination of the Exercise Price or the arithmetic calculation of the Warrant Shares, the Company shall promptly issue to the Holder the number of Warrant Shares that are not disputed and resolve such dispute in accordance with Section 11.

(f) Beneficial Ownership. Notwithstanding anything to the contrary contained herein, the Company shall not effect the exercise of any portion of this Warrant, and the Holder shall not have the right to exercise any portion of this Warrant, pursuant to the terms and conditions of this Warrant and any such exercise shall be null and void and treated as if never made, to the extent that after giving effect to such exercise, the Holder together with the other Attribution Parties collectively would beneficially own in excess of [4.99][9.99]% (the “**Maximum Percentage**”) of the number of shares of Common Stock outstanding immediately after giving effect to such exercise. For purposes of the foregoing sentence, the aggregate number of shares of Common Stock beneficially owned by the Holder and the other Attribution Parties shall include the number of shares of Common Stock held by the Holder and all other Attribution Parties plus the number of shares of Common Stock issuable upon exercise of this Warrant with respect to which the determination of such sentence is being made, but shall exclude the number of shares of Common Stock which would be issuable upon (A) exercise of the remaining, unexercised portion of this Warrant beneficially owned by the Holder or any of the other Attribution Parties and (B) exercise or conversion of the unexercised or unconverted portion of any other securities of the Company (including, without limitation, any convertible notes or convertible preferred stock or warrants, including the other Warrants) beneficially owned by the Holder or any other Attribution Party subject to a limitation on conversion or exercise analogous to the limitation contained in this Section 1(f). For purposes of this Section 1(f), beneficial ownership shall be calculated in accordance with Section 13(d) of the Securities Exchange Act of 1934, as amended (the “**1934 Act**”). For purposes of this Warrant, in determining the number of outstanding shares of Common Stock the Holder may acquire upon the exercise of this Warrant without exceeding the Maximum Percentage, the Holder may rely on the number of outstanding shares of Common Stock as reflected in (x) the Company's most recent Annual Report on Form 10-K, Quarterly Report on Form 10-Q and Current Reports on Form 8-K or other public filing with the Securities and Exchange Commission (the “**SEC**”), as the case may be, (y) a more recent public announcement by the Company or (z) any other written notice by the Company or the Transfer Agent setting forth the number of shares of Common Stock outstanding (the “**Reported Outstanding Share Number**”). If the Company receives an Exercise Notice from the Holder at a time when the actual number of outstanding shares of Common Stock is less than the Reported Outstanding Share Number, the Company shall (i) notify the Holder in writing of the number of shares of Common Stock then outstanding and, to the extent that such Exercise Notice would otherwise cause the Holder's beneficial ownership, as determined pursuant to this Section 1(f), to exceed the Maximum Percentage, the Holder must notify the Company of a reduced number of Warrant Shares to be purchased pursuant to such Exercise Notice (the number of shares by which such purchase is reduced, the “**Reduction Shares**”) and (ii) as soon as reasonably practicable, the Company shall return to the Holder any exercise price paid by the Holder for the Reduction Shares. For any reason at any time, upon the written or oral request of the Holder, the Company shall within one (1) Business Day confirm orally and in writing or by electronic mail to the 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 this Warrant, by the Holder and any other Attribution Party since the date as of which the Reported Outstanding Share Number was reported. In the event that the issuance of Common Stock to the Holder upon exercise of this Warrant results in the Holder and the other Attribution Parties being deemed to beneficially own, in the aggregate, more than the Maximum Percentage of the number of outstanding shares of Common Stock (as determined under Section 13(d) of the 1934 Act), the number of shares so issued by which the Holder's and the other Attribution Parties' aggregate beneficial ownership exceeds the Maximum Percentage (the “**Excess Shares**”) shall be deemed null and void and shall be cancelled ab initio, and the Holder shall not have the power to vote or to transfer the Excess Shares. As soon as reasonably practicable after the issuance of the Excess Shares has been deemed null and void, the Company shall return to the Holder the exercise price paid by the Holder for the Excess Shares. Upon delivery of a written notice to the Company, the Holder may from time to time increase or decrease the Maximum Percentage to any other percentage not in excess of 9.99% as specified in such notice; provided that (i) any such increase in the Maximum Percentage will not be effective until the sixty-first (61<sup>st</sup>) day after such notice is delivered to the Company and (ii) any such increase or decrease will apply only to the Holder and the other Attribution Parties and not to any other holder of Warrants that is not an Attribution Party of the Holder. For purposes of clarity, the shares of Common Stock issuable pursuant to the terms of this Warrant in excess of the Maximum Percentage shall not be deemed to be beneficially owned by the Holder for any purpose including for purposes of Section 13(d) or Rule 16a-1(a)(1) of the 1934 Act. No prior inability to exercise this Warrant pursuant to this paragraph shall have any effect on the applicability of the provisions of this paragraph with respect to any subsequent determination of exercisability. The provisions of this paragraph shall be construed and implemented in a manner otherwise than in strict conformity with the terms of this Section 1(f) to the extent necessary to correct this paragraph or any portion of this paragraph which may be defective or inconsistent with the intended beneficial ownership limitation contained in this Section 1(f) or to make changes or supplements necessary or desirable to properly give effect to such limitation. The limitation contained in this paragraph may not be waived and shall apply to a successor holder of this Warrant.

(g) **Required Reserve Amount.** So long as this Warrant remains outstanding, the Company shall at all times keep reserved for issuance under this Warrant a number of shares of Common Stock at least equal to 100% of the maximum number of shares of Common Stock as shall be necessary to satisfy the Company's obligation to issue shares of Common Stock under the Warrants then outstanding (without regard to any limitations on exercise) (the "**Required Reserve Amount**"); provided that at no time shall the number of shares of Common Stock reserved pursuant to this Section 1(g) be reduced other than in connection with any exercise of Warrants or such other event covered by Section 2(c) below. The Required Reserve Amount (including, without limitation, each increase in the number of shares so reserved) shall be allocated pro rata among the holders of the Warrants based on the number of shares of Common Stock issuable upon exercise of Warrants held by each holder thereof on the Issuance Date (without regard to any limitations on exercise) (the "**Authorized Share Allocation**"). In the event that a holder shall sell or otherwise transfer any of such holder's Warrants, each transferee shall be allocated a pro rata portion of such holder's Authorized Share Allocation. Any shares of Common Stock reserved and allocated to any Person which ceases to hold any Warrants shall be allocated to the remaining holders of Warrants, pro rata based on the number of shares of Common Stock issuable upon exercise of the Warrants then held by such holders thereof (without regard to any limitations on exercise).

(h) **Insufficient Authorized Shares.** If at any time while this Warrant remains outstanding the Company does not have a sufficient number of authorized and unreserved shares of Common Stock to satisfy its obligation to reserve for issuance the Required Reserve Amount (an “**Authorized Share Failure**”), then the Company shall promptly take all action reasonably necessary to increase the Company’s authorized shares of Common Stock to an amount sufficient to allow the Company to reserve the Required Reserve Amount for this Warrant then outstanding. Without limiting the generality of the foregoing sentence, as soon as practicable after the date of the occurrence of an Authorized Share Failure, but in no event later than ninety (90) days after the occurrence of such Authorized Share Failure, the Company shall hold a meeting of its stockholders for the approval of an increase in the number of authorized shares of Common Stock. In connection with such meeting, the Company shall provide each stockholder with a proxy statement and shall use its reasonable best efforts to solicit its stockholders’ approval of such increase in authorized shares of Common Stock and to cause its board of directors to recommend to the stockholders that they approve such proposal. Notwithstanding the foregoing, if any such time of an Authorized Share Failure, the Company is able to obtain the written consent of a majority of the shares of its issued and outstanding shares of Common Stock to approve the increase in the number of authorized shares of Common Stock, the Company may satisfy this obligation by obtaining such consent and submitting for filing with the SEC an Information Statement on Schedule 14C.



2. ADJUSTMENT OF EXERCISE PRICE AND NUMBER OF WARRANT SHARES. The Exercise Price and the number of Warrant Shares shall be adjusted from time to time as follows:

(a) Intentionally omitted.

(b) Intentionally omitted.

(c) Adjustment Upon Subdivision or Combination of Common Stock. If the Company at any time on or after the Subscription Date subdivides (by any stock split, stock dividend, recapitalization or otherwise) one or more classes of its outstanding shares of Common Stock into a greater number of shares, the Exercise Price in effect immediately prior to such subdivision will be proportionately reduced and the number of Warrant Shares will be proportionately increased. If the Company at any time on or after the Subscription Date combines (by combination, reverse stock split or otherwise) one or more classes of its outstanding shares of Common Stock into a smaller number of shares, the Exercise Price in effect immediately prior to such combination will be proportionately increased and the number of Warrant Shares will be proportionately decreased. Any adjustment under this Section 2(c) shall become effective at the close of business on the date the subdivision or combination becomes effective.

3. **RIGHTS UPON DISTRIBUTION OF ASSETS.** In addition to any adjustments pursuant to Section 2 above, if, on or after the Subscription Date and on or prior to the Termination Date, the Company shall declare or make any dividend or other distribution 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, options, evidence of indebtedness or any other assets by way of a dividend, spin off, reclassification, corporate rearrangement, scheme of arrangement or other similar transaction) (a “**Distribution**”), at any time after the issuance of this Warrant, then, in each such case, the Holder shall be entitled to participate in such Distribution to the same extent that the Holder would have participated therein if the Holder had held the number of shares of Common Stock acquirable upon complete exercise of this Warrant (without regard to any limitations or restrictions on exercise of this Warrant, 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 shares of Common Stock are to be determined for the participation in such Distribution (provided, however, that to the extent that the Holder's right to participate in any such Distribution would result in the Holder and the other Attribution Parties exceeding the Maximum Percentage, then the Holder shall not be entitled to participate in such Distribution to such extent (and shall not be entitled to beneficial ownership of such shares of Common Stock as a result of such Distribution (and beneficial ownership) to such extent) and the portion of such Distribution shall be held in abeyance for the benefit of the Holder until such time or times as its right thereto would not result in the Holder and the other Attribution Parties 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 held similarly in abeyance) to the same extent as if there had been no such limitation).

4. **PURCHASE RIGHTS; FUNDAMENTAL TRANSACTIONS.**

(a) **Purchase Rights.** In addition to any adjustments pursuant to Section 2 above, if at any time on or after the Subscription Date and on or prior to the Termination Date 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 any class 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 this Warrant (without regard to any limitations or restrictions on exercise of this Warrant, 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 Common Stock are to be determined for the grant, issuance or sale of such Purchase Rights (provided, however, that to the extent that the Holder's right to participate in any such Purchase Right would result in the Holder and the other Attribution Parties exceeding the Maximum Percentage, then the Holder shall not be entitled to participate in such Purchase Right to such extent (and shall not be entitled to beneficial ownership of such Common Stock as a result of such Purchase Right (and beneficial ownership) to such extent) and such Purchase Right to such extent shall be held in abeyance for the benefit of the Holder until such time or times as its right thereto would not result in the Holder and the other Attribution Parties 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).

(b) **Fundamental Transaction.** The Company shall not enter into or be party to a Fundamental Transaction unless the Successor Entity assumes in writing all of the obligations of the Company under this Warrant in accordance with the provisions of this Section 4(b), including agreements to deliver to the Holder in exchange for this Warrant a security of the Successor Entity evidenced by a written instrument substantially similar in form and substance to this Warrant, including, without limitation, which is exercisable for a corresponding number of shares of capital stock equivalent to the shares of Common Stock acquirable and receivable upon exercise of this Warrant (without regard to any limitations on the exercise of this Warrant) 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 shares of Common Stock pursuant to such Fundamental Transaction and the value of such shares of capital stock, such adjustments to the number of shares of capital stock and such exercise price being for the purpose of protecting the economic value of this Warrant immediately prior to the consummation of such Fundamental Transaction). Upon the consummation of each Fundamental Transaction, the Successor Entity shall succeed to, and be substituted for the Company (so that from and after the date of the applicable Fundamental Transaction, the provisions of this Warrant and the other Transaction Documents 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 Warrant with the same effect as if such Successor Entity had been named as the Company herein. Upon consummation of each Fundamental Transaction, the Successor Entity shall deliver to the Holder confirmation that there shall be issued upon exercise of this Warrant at any time after the consummation of the applicable Fundamental Transaction, in lieu of the shares of Common Stock (or other securities, cash, assets or other property (except such items still issuable under Sections 3 and 4(a) above, which shall continue to be receivable thereafter)) issuable upon the exercise of this Warrant prior to the applicable Fundamental Transaction, such shares of common stock (or its equivalent) of the Successor Entity (including its Parent Entity) which the Holder would have been entitled to receive upon the happening of the applicable Fundamental Transaction had this Warrant been exercised immediately prior to the applicable Fundamental Transaction (without regard to any limitations on the exercise of this Warrant), as adjusted in accordance with the provisions of this Warrant. Notwithstanding the foregoing, and without limiting Section 1(f) hereof, the Holder may elect, at its sole option, by delivery of written notice to the Company to waive this Section 4(b) to permit the Fundamental Transaction without the assumption of this Warrant. In addition to and not in substitution for any other rights hereunder, prior to the consummation of each Fundamental Transaction pursuant to which holders of shares of Common Stock are entitled to receive securities or other assets with respect to or in exchange for shares of Common Stock (a “**Corporate Event**”), the Company shall make appropriate provision to insure that the Holder will thereafter have the right to receive upon an exercise of this Warrant at any time after the consummation of the applicable Fundamental Transaction but prior to the Termination Date, in lieu of the shares of the Common Stock (or other securities, cash, assets or other property (except such items still issuable under Sections 3 and 4(a) above, which shall continue to be receivable thereafter)) issuable upon the exercise of the Warrant prior to such Fundamental Transaction, such shares of stock, securities, cash, assets or any other property whatsoever (including warrants or other purchase or subscription rights) (collectively, the “**Corporate Event Consideration**”) which the Holder would have been entitled to receive upon the happening of the applicable Fundamental Transaction had this Warrant been exercised immediately prior to the applicable Fundamental Transaction (without regard to any limitations on the exercise of this Warrant). The provision made pursuant to the preceding sentence shall be in a form and substance reasonably satisfactory to the Requisite Holders. The provisions of this Section 4(b) shall apply similarly and equally to successive Fundamental Transactions and Corporate Events.

5. NONCIRCUMVENTION. The Company hereby covenants and agrees that the Company will not, by amendment of its Certificate of Incorporation or Bylaws, or through any reorganization, transfer of assets, consolidation, merger, scheme of arrangement, dissolution, issuance or sale of securities, or any other voluntary action, avoid or seek to avoid the observance or performance of any of the terms of this Warrant, and will at all times in good faith carry out all of the provisions of this Warrant and take all action as may be required to protect the rights of the Holder. Without limiting the generality of the foregoing, the Company (i) shall not increase the par value of any shares of Common Stock receivable upon the exercise of this Warrant above the Exercise Price then in effect, (ii) shall take all such actions as may be necessary or appropriate in order that the Company may validly and legally issue fully paid and nonassessable shares of Common Stock upon the exercise of this Warrant, and (iii) shall, so long as any of the Warrants are outstanding, take all action necessary to reserve and keep available out of its authorized and unissued shares of Common Stock, solely for the purpose of effecting the exercise of the Warrants, the number of shares of Common Stock as shall from time to time be necessary to effect the exercise of the Warrants then outstanding (without regard to any limitations on exercise).

6. WARRANT HOLDER NOT DEEMED A STOCKHOLDER. Except as otherwise specifically provided herein, the Holder, solely in such Person's capacity as a holder of this Warrant, shall not be entitled to vote or receive dividends or be deemed the holder of capital stock of the Company for any purpose, nor shall anything contained in this Warrant be construed to confer upon the Holder, solely in such Person's capacity as the Holder of this Warrant, any of the rights of a stockholder of the Company or any right to vote, give or withhold consent to any corporate action (whether any reorganization, issue of stock, reclassification of stock, consolidation, merger, conveyance or otherwise), receive notice of meetings, receive dividends or subscription rights, or otherwise, prior to the issuance to the Holder of the Warrant Shares which such Person is then entitled to receive upon the due exercise of this Warrant. In addition, nothing contained in this Warrant shall be construed as imposing any liabilities on the Holder to purchase any securities (upon exercise of this Warrant or otherwise) or as a stockholder of the Company, whether such liabilities are asserted by the Company or by creditors of the Company. Notwithstanding this Section 6, the Company shall provide the Holder with copies of the same notices and other information given to the stockholders of the Company generally, contemporaneously with the giving thereof to the stockholders.

(a) Transfer of Warrant. If this Warrant is to be transferred, the Holder shall surrender this Warrant to the Company, whereupon the Company will forthwith issue and deliver upon the order of the Holder a new Warrant (in accordance with Section 7(d)), registered as the Holder may request, representing the right to purchase the number of Warrant Shares being transferred by the Holder and, if less than the total number of Warrant Shares then underlying this Warrant is being transferred, a new Warrant (in accordance with Section 7(d)) to the Holder representing the right to purchase the number of Warrant Shares not being transferred.

(b) Lost, Stolen or Mutilated Warrant. Upon receipt by the Company of evidence reasonably satisfactory to the Company of the loss, theft, destruction or mutilation of this Warrant, and, in the case of loss, theft or destruction, of any indemnification undertaking by the Holder to the Company in customary form (but without the obligation to post a bond) and, in the case of mutilation, upon surrender and cancellation of this Warrant, the Company shall execute and deliver to the Holder a new Warrant (in accordance with Section 7(d)) representing the right to purchase the Warrant Shares then underlying this Warrant.

(c) Exchangeable for Multiple Warrants. This Warrant is exchangeable, upon the surrender hereof by the Holder at the principal office of the Company, for a new Warrant or Warrants (in accordance with Section 7(d)) representing in the aggregate the right to purchase the number of Warrant Shares then underlying this Warrant, and each such new Warrant will represent the right to purchase such portion of such Warrant Shares as is designated by the Holder at the time of such surrender.

(d) Issuance of New Warrants. Whenever the Company is required to issue a new Warrant pursuant to the terms of this Warrant, such new Warrant (i) shall be of like tenor with this Warrant, (ii) shall represent, as indicated on the face of such new Warrant, the right to purchase the Warrant Shares then underlying this Warrant (or in the case of a new Warrant being issued pursuant to Section 7(a) or Section 7(c), the Warrant Shares designated by the Holder which, when added to the number of shares of Common Stock underlying the other new Warrants issued in connection with such issuance, does not exceed the number of Warrant Shares then underlying this Warrant), (iii) shall have an issuance date, as indicated on the face of such new Warrant which is the same as the Issuance Date, and (iv) shall have the same rights and conditions as this Warrant.

8. **NOTICES.** Whenever notice is required to be given under this Warrant, including, without limitation, an Exercise Notice, unless otherwise provided herein, such notice shall be given in writing, (i) if delivered (a) from within the domestic United States, by first-class registered or certified airmail, or nationally recognized overnight express courier, postage prepaid, electronic mail or by facsimile or (b) from outside the United States, by International Federal Express, electronic mail or facsimile, and (ii) will be deemed given (A) if delivered by first-class registered or certified mail domestic, three (3) Business Days after so mailed, (B) if delivered by nationally recognized overnight carrier, one (1) Business Day after so mailed, (C) if delivered by International Federal Express, two (2) Business Days after so mailed and (D) at the time of transmission, if delivered by electronic mail to each of the email addresses specified in this Section 8 prior to 5:00 p.m. (New York time) on a Trading Day, (E) the next Trading Day after the date of transmission, if delivered by electronic mail to each of the email addresses specified in this Section 8 on a day that is not a Trading Day or later than 5:00 p.m. (New York time) on any Trading Day and (F) if delivered by facsimile, upon electronic confirmation of delivery of such facsimile, and will be delivered and addressed as follows:

(i) if to the Company, to:

Bionano Genomics, Inc.  
9540 Towne Centre Drive  
Suite 100  
San Diego, CA 92121  
Attention: R. Erik Holmlin, President and Chief Executive Officer  
Facsimile: (858) 888-7601  
Email: Eholmlin@bionanogenomics.com

(ii) if to the Holder, at such address or other contact information delivered by the Holder to Company or as is on the books and records of the Company.

The Company shall provide the Holder with prompt written notice of all actions taken pursuant to this Warrant, including in reasonable detail a description of such action and the reason therefor. Without limiting the generality of the foregoing, the Company will give written notice to the Holder (i) immediately upon any adjustment of the Exercise Price, setting forth in reasonable detail, and certifying, the calculation of such adjustment and (ii) at least fifteen (15) days prior to the date on which the Company closes its books or takes a record (A) with respect to any dividend or distribution upon the shares of Common Stock, (B) with respect to any grants, issuances or sales of any Options, Convertible Securities or rights to purchase stock, warrants, securities or other property to holders of shares of Common Stock or (C) for determining rights to vote with respect to any Fundamental Transaction, dissolution or liquidation; provided in each case that such information shall be made known to the public prior to or in conjunction with such notice being provided to the Holder. It is expressly understood and agreed that the time of exercise specified by the Holder in each Exercise Notice shall be definitive and may not be disputed or challenged by the Company.

9. **AMENDMENT AND WAIVER.** Except as otherwise provided herein, the provisions of this Warrant may be amended or waived and the Company may take any action herein prohibited, or omit to perform any act herein required to be performed by it, only if the Company has obtained the written consent of the Holder.

10.

**GOVERNING LAW; JURISDICTION; JURY TRIAL.** This Warrant shall be governed by and construed and enforced in accordance with, and all questions concerning the construction, validity, interpretation and performance of this Warrant shall be governed by, the internal laws of the State of New York, without giving effect to any choice of law or conflict of law provision or rule (whether of the State of New York or any other jurisdictions) that would cause the application of the laws of any jurisdictions other than the State of New York. The Company hereby irrevocably submits to the exclusive jurisdiction of the state and federal courts sitting in The City of New York, Borough of Manhattan, 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 suit, action or proceeding, any claim that it is not personally subject to the jurisdiction of any such court, that such suit, action or proceeding is brought in an inconvenient forum or that the venue of such suit, action or proceeding is improper. The Company hereby irrevocably waives personal service of process and consents to process being served in any such suit, action or proceeding by mailing a copy thereof to the Company at the address set forth in Section 8(i) above or such other address as the Company subsequently delivers to the Holder 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. Nothing contained herein shall be deemed or operate to preclude the Holder from bringing suit or taking other legal action against the Company in any other jurisdiction to collect on the Company's obligations to the Holder, to realize on any collateral or any other security for such obligations, or to enforce a judgment or other court ruling in favor of the Holder. If either party shall commence an action, suit or proceeding to enforce any provisions of this Warrant, the prevailing party in such action, suit or proceeding shall be reimbursed by the other party for their reasonable attorneys' fees and other costs and expenses incurred with the investigation, preparation and prosecution of such action or proceeding. **THE COMPANY HEREBY IRREVOCABLY WAIVES ANY RIGHT IT MAY HAVE, AND AGREES NOT TO REQUEST, A JURY TRIAL FOR THE ADJUDICATION OF ANY DISPUTE HEREUNDER OR IN CONNECTION WITH OR ARISING OUT OF THIS WARRANT OR ANY TRANSACTION CONTEMPLATED HEREBY.**



11. DISPUTE RESOLUTION. In the case of a dispute as to the determination of the Exercise Price or the arithmetic calculation of the Warrant Shares, the Company shall submit the disputed determinations or arithmetic calculations via facsimile or electronic mail within two (2) Business Days of receipt of the Exercise Notice or other event giving rise to such dispute, as the case may be, to the Holder. If the Holder and the Company are unable to agree upon such determination or calculation of the Exercise Price or the Warrant Shares within three (3) Business Days of such disputed determination or arithmetic calculation being submitted to the Holder, then the Company shall, within two (2) Business Days submit via facsimile or electronic mail (a) the disputed determination of the Exercise Price to an independent, reputable investment bank selected by the Company and approved by the Holder or (b) the disputed arithmetic calculation of the Warrant Shares to the Company's independent, outside accountant. The Company shall cause at its expense the investment bank or the accountant, as the case may be, to perform the determinations or calculations and notify the Company and the Holder of the results no later than ten (10) Business Days from the time it receives the disputed determinations or calculations. Such investment bank's or accountant's determination or calculation, as the case may be, shall be binding upon all parties absent demonstrable error.

12. REMEDIES, OTHER OBLIGATIONS, BREACHES AND INJUNCTIVE RELIEF. The remedies provided in this Warrant shall be cumulative and in addition to all other remedies available under this Warrant and any other Transaction Documents, at law or in equity (including a decree of specific performance and/or other injunctive relief), and nothing herein shall limit the right of the Holder to pursue actual damages for any failure by the Company to comply with the terms of this Warrant. The Company acknowledges that a breach by it of its obligations hereunder will cause irreparable harm to the Holder and that the remedy at law for any such breach may be inadequate. The Company therefore agrees that, in the event of any such breach or threatened breach, the holder of this Warrant shall be entitled, in addition to all other available remedies, to an injunction restraining any breach, without the necessity of showing economic loss and without any bond or other security being required.

13. TRANSFER. This Warrant and the Warrant Shares may be offered for sale, sold, transferred, pledged or assigned without the consent of the Company.

14. SEVERABILITY; CONSTRUCTION; HEADINGS. If any provision of this Warrant is prohibited by law or otherwise determined to be invalid or unenforceable by a court of competent jurisdiction, the provision that would otherwise be prohibited, invalid or unenforceable shall be deemed amended to apply to the broadest extent that it would be valid and enforceable, and the invalidity or unenforceability of such provision shall not affect the validity of the remaining provisions of this Warrant so long as this Warrant as so modified continues to express, without material change, the original intentions of the parties as to the subject matter hereof and the prohibited nature, invalidity or unenforceability of the provision(s) in question does not substantially impair the respective expectations or reciprocal obligations of the parties or the practical realization of the benefits that would otherwise be conferred upon the parties. The parties will endeavor in good faith negotiations to replace the prohibited, invalid or unenforceable provision(s) with a valid provision(s), the effect of which comes as close as possible to that of the prohibited, invalid or unenforceable provision(s). This Warrant shall be deemed to be jointly drafted by the Company and the Holder and shall not be construed against any Person as the drafter hereof. The headings of this Warrant are for convenience of reference and shall not form part of, or affect the interpretation of, this Warrant.

15. DISCLOSURE. Upon receipt or delivery by the Company of any notice in accordance with the terms of this Warrant, unless the Company has in good faith determined that the matters relating to such notice do not constitute material, nonpublic information relating to the Company or its subsidiaries, the Company shall contemporaneously with any such receipt or delivery publicly disclose such material, nonpublic information on a Current Report on Form 8-K or otherwise. In the event that the Company believes that a notice contains material, nonpublic information relating to the Company or its subsidiaries, the Company so shall indicate to such Holder contemporaneously with delivery of such notice, and in the absence of any such indication, the Holder shall be allowed to presume that all matters relating to such notice do not constitute material, nonpublic information relating to the Company or its subsidiaries.

16. CERTAIN DEFINITIONS. For purposes of this Warrant, the following terms shall have the following meanings:

(a) “**Affiliate**” means, with respect to any Person, any other Person that directly or indirectly controls, is controlled by, or is under common control with, such Person, it being understood for purposes of this definition that “control” of a Person means the power directly or indirectly either to vote 10% or more of the stock having ordinary voting power for the election of directors of such Person or direct or cause the direction of the management and policies of such Person whether by contract or otherwise.

(b) **“Attribution Parties”** means, collectively, the following Persons and entities: (i) any investment vehicle, including, any funds, feeder funds or managed accounts, currently, or from time to time after the Subscription Date, directly or indirectly managed or advised by the Holder's investment manager or any of its Affiliates or principals, (ii) any direct or indirect Affiliates of the Holder or any of the foregoing, (iii) any Person acting or who could be deemed to be acting as a Group together with the Holder or any of the foregoing and (iv) any other Persons whose beneficial ownership of the Company's Common Stock would or could be aggregated with the Holder's and the other Attribution Parties for purposes of Section 13(d) of the 1934 Act. For clarity, the purpose of the foregoing is to subject collectively the Holder and all other Attribution Parties to the Maximum Percentage.

(c) **“Bid Price”** means, for any security as of the particular time of determination, the bid price for such security on the Principal Market as reported by Bloomberg as of such time of determination, or, if the Principal Market is not the principal securities exchange or trading market for such security, the bid price of such security on the principal securities exchange or trading market where such security is listed or traded as reported by Bloomberg as of such time of determination, or if the foregoing does not apply, the bid price of such security in the over-the-counter market on the electronic bulletin board for such security as reported by Bloomberg as of such time of determination, or, if no bid price is reported for such security by Bloomberg as of such time of determination, the average of the bid prices of any market makers for such security as reported in the “pink sheets” by OTC Markets Group Inc. (formerly Pink Sheets LLC) as of such time of determination. If the Bid Price cannot be calculated for a security as of the particular time of determination on any of the foregoing bases, the Bid Price of such security as of such time of determination shall be the fair market value as mutually determined by the Company and the Holder. If the Company and the Holder are unable to agree upon the fair market value of such security, then such dispute shall be resolved in accordance with the procedures in Section 11. All such determinations shall be appropriately adjusted for any stock dividend, stock split, stock combination or other similar transaction during such period.

(d) **“Bloomberg”** means Bloomberg Financial Markets.

(e) **“Business Day”** means any day other than Saturday, Sunday or other day on which commercial banks in The City of New York are authorized or required by law to remain closed.

(f) **“Change of Control”** means any Fundamental Transaction other than (i) any reorganization, recapitalization or reclassification of the Common Stock in which holders of the Company’s voting power immediately prior to such reorganization, recapitalization or reclassification continue after such reorganization, recapitalization or reclassification to hold publicly traded securities and, directly or indirectly, are, in all material respect, the holders of the voting power of the surviving entity (or entities with the authority or voting power to elect the members of the board of directors (or their equivalent if other than a corporation) of such entity or entities) after such reorganization, recapitalization or reclassification, (ii) pursuant to a migratory merger effected solely for the purpose of changing the jurisdiction of incorporation of the Company or (iii) a merger in connection with a bona fide acquisition by the Company of any Person in which (x) the gross consideration paid, directly or indirectly, by the Company in such acquisition is not greater than 20% of the Company’s market capitalization as calculated on the date of the consummation of such merger and (y) such merger does not contemplate a change to the identity of a majority of the board of directors of the Company. Notwithstanding anything herein to the contrary, any transaction or series of transactions that, directly or indirectly, results in the Company or the Successor Entity not having Common Stock or common stock, as applicable, registered under the 1934 Act and listed on an Eligible Market shall be deemed a Change of Control.

(g) “**Closing Bid Price**” and “**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 Principal Market, as reported by Bloomberg, or, if the Principal Market 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 Principal Market 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 Bid Price or the Closing Sale Price cannot be calculated for a security on a particular date on any of the foregoing bases, the Closing Bid Price or the Closing Sale Price, as the case may be, of such security on such date shall be the fair market value as mutually determined by the Company and the Holder. If the Company and the Holder are unable to agree upon the fair market value of such security, then such dispute shall be resolved pursuant to Section 11. All such determinations to be appropriately adjusted for any stock dividend, stock split, stock combination, reclassification or other similar transaction during the applicable calculation period.

(h) “**Common Stock**” means (i) the Company's Common Stock, par value \$0.0001 per share, and (ii) any capital stock into which such Common Stock shall have been changed or any capital stock resulting from a reclassification of such Common Stock.

(i) “**Convertible Securities**” means any stock or securities (other than Options) directly or indirectly convertible into or exercisable or exchangeable for shares of Common Stock.

(j) “**Eligible Market**” means The Nasdaq Capital Market, the NYSE American LLC, The Nasdaq Global Select Market, The Nasdaq Global Market or The New York Stock Exchange, Inc.

(l) **“Fundamental Transaction”** means (A) that the Company shall, directly or indirectly, including through subsidiaries, Affiliates or otherwise, in one or more related transactions, (i) consolidate or merge with or into (whether or not the Company is the surviving corporation) another Subject Entity, or (ii) sell, assign, transfer, convey or otherwise dispose of all or substantially all of the properties or assets of the Company or any of its “significant subsidiaries” (as defined in Rule 1-02 of Regulation S-X) to one or more Subject Entities, or (iii) make, or allow one or more Subject Entities to make, or allow the Company to be subject to or have its shares of Common Stock be subject to or party to one or more Subject Entities making, a purchase, tender or exchange offer that is accepted by the holders of at least either (x) 50% of the outstanding shares of Common Stock, (y) 50% of the outstanding shares of Common Stock calculated as if any shares of Common Stock held by all Subject Entities making or party to, or Affiliated with any Subject Entities making or party to, such purchase, tender or exchange offer were not outstanding; or (z) such number of shares of Common Stock such that all Subject Entities making or party to, or Affiliated with any Subject Entity making or party to, such purchase, tender or exchange offer, become collectively the beneficial owners (as defined in Rule 13d-3 under the 1934 Act) of at least 50% of the outstanding shares of Common Stock, or (iv) consummate a stock purchase agreement or other business combination (including, without limitation, a reorganization, recapitalization, spin-off or scheme of arrangement) with one or more Subject Entities whereby all such Subject Entities, individually or in the aggregate, acquire, either (x) at least 50% of the outstanding shares of Common Stock, (y) at least 50% of the outstanding shares of Common Stock calculated as if any shares of Common Stock held by all the Subject Entities making or party to, or Affiliated with any Subject Entity making or party to, such stock purchase agreement or other business combination were not outstanding; or (z) such number of shares of Common Stock such that the Subject Entities become collectively the beneficial owners (as defined in Rule 13d-3 under the 1934 Act) of at least 50% of the outstanding shares of Common Stock, or (v) reorganize, recapitalize or reclassify its shares of Common Stock, (B) that the Company shall, directly or indirectly, including through subsidiaries, Affiliates or otherwise, in one or more related transactions, allow any Subject Entity individually or the Subject Entities in the aggregate to be or become the “beneficial owner” (as defined in Rule 13d-3 under the 1934 Act), directly or indirectly, whether through acquisition, purchase, assignment, conveyance, tender, tender offer, exchange, reduction in outstanding shares of Common Stock, merger, consolidation, business combination, reorganization, recapitalization, spin-off, scheme of arrangement, reorganization, recapitalization or reclassification or otherwise in any manner whatsoever, of either (x) at least 50% of the aggregate ordinary voting power represented by issued and outstanding shares of Common Stock, (y) at least 50% of the aggregate ordinary voting power represented by issued and outstanding shares of Common Stock not held by all such Subject Entities as of the Subscription Date calculated as if any shares of Common Stock held by all such Subject Entities were not outstanding, or (z) a percentage of the aggregate ordinary voting power represented by issued and outstanding shares of Common Stock or other equity securities of the Company sufficient to allow such Subject Entities to effect a statutory short form merger or other transaction requiring other stockholders of the Company to surrender their Common Stock without approval of the stockholders of the Company or (C) directly or indirectly, including through subsidiaries, Affiliates or otherwise, in one or more related transactions, the issuance of or the entering into any other instrument or transaction structured in a manner to circumvent, or that circumvents, the intent of this definition in which case this definition shall be construed and implemented in a manner otherwise than in strict conformity with the terms of this definition to the extent necessary to correct this definition or any portion of this definition which may be defective or inconsistent with the intended treatment of such instrument or transaction.

(m) **“Group”** means a “group” as that term is used in Section 13(d) of the 1934 Act and as defined in Rule 13d-5 thereunder.

(n) **“Options”** means any rights, warrants or options to subscribe for or purchase shares of Common Stock or Convertible Securities.

(o) **“Parent Entity”** of a Person means an entity that, directly or indirectly, controls the applicable Person, including such entity whose common stock or equivalent equity security is quoted or listed on an Eligible Market (or, if so elected by the Holder, any other market, exchange or quotation system), or, if there is more than one such Person or such entity, the Person or such entity designated by the Holder or in the absence of such designation, such Person or entity with the largest public market capitalization as of the date of consummation of the Fundamental Transaction or Change of Control.

(p) **“Person”** means an individual, a limited liability company, a partnership, a joint venture, a corporation, a trust, an unincorporated organization, any other entity and a government or any department or agency thereof.

(q) **“Principal Market”** means The Nasdaq Capital Market.

(s) **“Standard Settlement Period”** means the standard settlement period, expressed in a number of Trading Days, for the Company’s primary trading market or quotation system with respect to the Common Stock that is in effect on the date of receipt of an applicable Exercise Notice.

(t) **“Subject Entity”** means any Person, Persons or Group or any Affiliate or associate of any such Person, Persons or Group.

(u) **“Successor Entity”** means one or more Person or Persons (or, if so elected by the Holder, the Company or Parent Entity) formed by, resulting from or surviving any Fundamental Transaction or Change of Control or one or more Person or Persons (or, if so elected by the Holder, the Company or the Parent Entity) with which such Fundamental Transaction or Change of Control shall have been entered into.

(v) **“Trading Day”** means any day on which the Common Stock is traded on the Principal Market, or, if the Principal Market is not the principal trading market for the Common Stock, then on the principal securities exchange or

securities market on which the Common Stock is then traded.

(w) “**Transaction Documents**” means any agreement entered into by and between the Company and the Holder, as applicable.

(x) “**Weighted Average Price**” means, for any security as of any date, the dollar volume-weighted average price for such security on the Principal Market during the period beginning at 9:30:01 a.m., New York time (or such other time as the Principal Market publicly announces is the official open of trading), and ending at 4:00:00 p.m., New York time (or such other time as the Principal Market publicly announces is the official close of trading), as reported by Bloomberg through its “Volume at Price” function or, if the foregoing does not apply, the dollar volume-weighted average price of such security in the over-the-counter market on the electronic bulletin board for such security during the period beginning at 9:30:01 a.m., New York time (or such other time as such market publicly announces is the official open of trading), and ending at 4:00:00 p.m., New York time (or such other time as such market publicly announces is the official close of trading), as reported by Bloomberg, or, if no dollar volume-weighted average price is reported for such security by Bloomberg for such hours, the average of the highest Closing Bid Price and the lowest closing ask price of any of the 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 Weighted Average Price cannot be calculated for a security on a particular date on any of the foregoing bases, the Weighted Average Price of such security on such date shall be the fair market value as mutually determined by the Company and the Holder. If the Company and the Holder are unable to agree upon the fair market value of such security, then such dispute shall be resolved pursuant to Section 11 with the term “Weighted Average Price” being substituted for the term “Exercise Price.” All such determinations shall be appropriately adjusted for any stock dividend, stock split, stock combination, reclassification or other similar transaction during the applicable calculation period.

**[Signature Page Follows]**



**IN WITNESS WHEREOF**, the Company has caused this Warrant to Purchase Common Stock to be duly executed as of the Issuance Date set out above.

**Bionano Genomics, Inc.**

By: \_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_

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## EXERCISE NOTICE

TO BE EXECUTED BY THE REGISTERED HOLDER TO EXERCISE THIS  
PRE-FUNDED WARRANT TO PURCHASE COMMON STOCK

## BIONANO GENOMICS, INC.

The undersigned holder hereby exercises the right to purchase \_\_\_\_\_ shares of Common Stock (“**Warrant Shares**”) of Bionano Genomics, Inc., a company organized under the laws of Delaware (the “**Company**”), evidenced by the attached Pre-Funded Warrant to Purchase Common Stock (the “**Warrant**”). Capitalized terms used herein and not otherwise defined shall have the respective meanings set forth in the Warrant.

1. Form of Exercise Price. 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.

2. Payment of Exercise Price. In the event that the holder has elected a Cash Exercise with respect to some or all of the Warrant Shares to be issued pursuant hereto, the holder shall pay the Aggregate Exercise Price in the sum of \$\_\_\_\_\_ to the Company in accordance with the terms of the Warrant.

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3. Delivery of Warrant Shares. The Company shall deliver to the holder \_\_\_\_\_ Warrant Shares in accordance with the terms of the Warrant.

Date: \_\_\_\_\_, \_\_\_\_\_

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Name of Registered Holder

By: \_\_\_\_\_

Name:

Title:

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**ACKNOWLEDGMENT**

The Company hereby acknowledges this Exercise Notice and hereby directs American Stock Transfer & Trust Company, LLC to issue the above indicated number of shares of Common Stock on or prior to the applicable Share Delivery Date.

**Bionano Genomics, Inc.**

By: \_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_

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Thomas A. Coll  
+1 858 550 6013  
collta@cooley.com

October 17, 2019

Bionano Genomics, Inc.  
9540 Towne Centre Drive, Suite 100  
San Diego, CA 92121

Ladies and Gentlemen:

We have acted as counsel to Bionano Genomics, Inc., a Delaware corporation (the “**Company**”), in connection with the filing by the Company of a Registration Statement (No. 333-233828) 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 an aggregate of 5,265,000 shares (the “**Shares**”) of Common Stock of the Company, par value \$0.0001 per share (the “**Common Stock**”), or pre-funded warrants to purchase shares of Common Stock (the “**Pre-Funded Warrants**”), (ii) warrants to purchase up to 5,265,000 shares of Common Stock (the “**Common Warrants**” and, together with the Pre-Funded Warrants, the “**Warrants**”), and (iii) up to 10,530,000 shares of Common Stock issuable upon exercise of the Warrants (the “**Warrant Shares**”; together with the Shares and the Warrants, the “**Securities**”). The Securities are to be sold by the Company as described in the Registration Statement and the Prospectus.

In connection with this opinion, we have examined and relied upon the Registration Statement, the Prospectus, the form of Common Warrant, the form of Pre-Funded Warrant, the Company’s amended and restated certificate of incorporation and amended and restated bylaws, each as currently in effect, and 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. 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; the accuracy, completeness and authenticity of certificates of public officials; and the due execution and delivery of all documents by all persons other than 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 independently sought to verify such matters.

Our opinion is expressed only with respect to the General Corporation Law of the State of Delaware and, as to the Warrants constituting valid and binding obligations of the Company, with respect to the laws of the State of New York. We express no opinion to the extent that any other laws are applicable to the subject matter hereof and express no opinion and provide no assurance as to compliance with any federal or state securities law, rule or regulation.

With regard to our opinion concerning the Warrants constituting valid and binding obligations of the Company:

(i) Our opinion is subject to, and may be limited by, (a) applicable bankruptcy, reorganization, insolvency, moratorium, fraudulent conveyance, debtor and creditor, and similar laws which relate to or affect creditors’ rights generally, and (b) general principles of equity (including, without limitation, concepts of materiality, reasonableness, good faith and fair dealing) regardless of whether considered in a proceeding in equity or at law.

(ii) Our opinion is subject to the qualification that the availability of specific performance, an injunction or other equitable remedies is subject to the discretion of the court before which the request is brought.

Cooley LLP 4401 Eastgate Mall San Diego, CA 92121  
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Ladies and Gentlemen:

October 17, 2019

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(iii) We express no opinion as to any provision of the Warrants that: (a) provides for liquidated damages, buy-in damages, monetary penalties, prepayment or make-whole payments or other economic remedies to the extent such provisions may constitute unlawful penalties, (b) relates to advance waivers of claims, defenses, rights granted by law, or notice, opportunity for hearing, evidentiary requirements, statutes of limitations, trial by jury, or procedural rights, (c) restricts non-written modifications and waivers, (d) provides for the payment of legal and other professional fees where such payment is contrary to law or public policy, (e) relates to exclusivity, election or accumulation of rights or remedies, (f) authorizes or validates conclusive or discretionary determinations, or (g) provides that provisions of the Warrants are severable to the extent an essential part of the agreed exchange is determined to be invalid and unenforceable.

(iv) We express no opinion as to whether a state court outside of the State of New York or a federal court of the United States would give effect to the choice of New York law or jurisdiction provided for in the Warrants.

With respect to our opinion regarding the Warrant Shares, we express no opinion to the extent that, notwithstanding the Company's current reservation of the maximum number of Warrant Shares as of the date hereof, future issuances of securities of the Company, including the Warrant Shares, and/or antidilution adjustments to outstanding securities of the Company, including the Warrants, may cause the Warrants to be exercisable for more shares of Common Stock than the number that then remain authorized but unissued. Further, we have assumed the Exercise Price (as defined in the Warrants) will not be adjusted to an amount below the par value per share of the Warrant Shares.

On the basis of the foregoing, and in reliance thereon, we are of the opinion that (i) the Shares, when sold and issued in accordance with the Registration Statement and the Prospectus, will be validly issued, fully paid and nonassessable, (ii) provided that the Warrants have been duly executed and delivered by the Company to the purchasers thereof against payment therefor as provided in the Registration Statement and the Prospectus, the Warrants will be valid and binding obligations of the Company and (iii) the Warrant Shares, when issued and paid for in accordance with the terms of the Warrants, 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 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

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**CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM**

We consent to the incorporation by reference in this Amendment No. 1 to Registration Statement No. 333-233828 on Form S-1 of our report dated March 14, 2019, relating to the consolidated financial statements of Bionano Genomics, Inc. appearing in the Annual Report on Form 10-K of Bionano Genomics, Inc. for the year ended December 31, 2018 (which report expresses an unqualified opinion and includes an explanatory paragraph relating to substantial doubt about Bionano Genomics, Inc.'s ability to continue as a going concern), and to the reference to us under the heading "Experts" in the Prospectus, which is part of this Registration Statement.

/s/ DELOITTE & TOUCHE LLP

San Diego, California

October 17, 2019

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