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

SCHEDULE 14A

Proxy Statement Pursuant to Section 14(a) of
the Securities Exchange Act of 1934 (Amendment No.)

Filed by the Registrant

Filed by a Party other than the Registrant

Check the appropriate box:

- Preliminary Proxy Statement
- Confidential, for Use of the Commission Only (as permitted by Rule 14a-6(e)(2))**
- Definitive Proxy Statement
- Definitive Additional Materials
- Soliciting Material under §240.14a-12

IDERA PHARMACEUTICALS, INC.

(Name of Registrant as Specified In Its Charter)

(Name of Person(s) Filing Proxy Statement, if other than the Registrant)

Payment of Filing Fee (Check the appropriate box):

- No fee required.
- Fee computed on table below per Exchange Act Rules 14a-6(i)(1) and 0-11.
- (1) Title of each class of securities to which transaction applies: _____
- (2) Aggregate number of securities to which transaction applies: _____
- (3) Per unit price or other underlying value of transaction computed pursuant to Exchange Act Rule 0-11 (set forth the amount on which the filing fee is calculated and state how it was determined): _____
- (4) Proposed maximum aggregate value of transaction: _____
- (5) Total fee paid: _____

Fee paid previously with preliminary materials.

Check box if any part of the fee is offset as provided by Exchange Act Rule 0-11(a)(2) and identify the filing for which the offsetting fee was paid previously. Identify the previous filing by registration statement number, or the Form or Schedule and the date of its filing.

- (1) Amount Previously Paid: _____
- (2) Form, Schedule or Registration Statement No.: _____
- (3) Filing Party: _____
- (4) Date Filed: _____

IDERA PHARMACEUTICALS, INC.

167 Sidney Street
Cambridge, Massachusetts 02139

NOTICE OF 2018 ANNUAL MEETING OF STOCKHOLDERS

Date and Time: Wednesday, June 20, 2018 at 10:00 a.m., local time

Place: Idera Pharmaceuticals, Inc.
505 Eagleview Boulevard
Suite 212
Exton, Pennsylvania 19341

Items of Business: At our 2018 annual meeting of stockholders we will ask our stockholders to:

- Elect three Class II directors to our board of directors for terms to expire at the 2021 annual meeting of stockholders;
- Approve an amendment to our Restated Certificate of Incorporation, as amended, to effect a reverse stock split of our issued and outstanding common stock by a whole number ratio of not less than 1-for-4 and not more than 1-for-8, such ratio and the implementation and timing of such reverse stock split to be determined in the discretion of our board of directors at any time prior to our 2019 annual meeting of stockholders, and, in connection therewith, to decrease the number of authorized shares of our common stock on a basis proportional to the reverse stock split ratio;
- Approve an amendment to our Restated Certificate of Incorporation, as amended, to set the number of authorized shares of our common stock at a number determined by calculating the product of 280,000,000 multiplied by two times (2x) the reverse stock split ratio. This Proposal Three is subject to approval by our stockholders of the amendment to our Restated Certificate of Incorporation, as amended, effecting the reverse stock split as set forth in Proposal Two and, therefore, will not be implemented unless Proposal Two is approved and such reverse stock split is implemented;
- Approve, by non-binding vote, executive compensation;
- Ratify the selection of Ernst & Young LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2018; and
- Transact any other business as may properly come before the 2018 annual meeting or any postponement or adjournment of the 2018 annual meeting.

The board of directors has no knowledge of any other business to be transacted at the 2018 annual meeting.

Record Date: You may vote at the 2018 annual meeting if you were a stockholder of record at the close of business on May 17, 2018.

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Proxy Voting:

It is important that your shares be represented and voted at the 2018 annual meeting. Whether or not you plan to attend the 2018 annual meeting, please mark, sign, date and promptly mail your proxy card in the enclosed postage-paid envelope or follow the instructions on the proxy card to vote by telephone or over the internet. You may revoke your proxy at any time before its exercise at the 2018 annual meeting.

By order of the board of directors,

/s/ LOUIS J. ARCUDI, III

Louis J. Arcudi, III
*Senior Vice President of Operations, Chief Financial
Officer, Treasurer and Assistant Secretary*
Cambridge, Massachusetts

May 22, 2018

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IDERA PHARMACEUTICALS, INC.

**167 Sidney Street
Cambridge, Massachusetts 02139**

PROXY STATEMENT

For our Annual Meeting of Stockholders to be held on June 20, 2018

Idera Pharmaceuticals, Inc., a Delaware corporation, which is referred to as "we," "us," the "Company" or "Idera" in this proxy statement, is sending you this proxy statement and the enclosed proxy card because our board of directors is soliciting your proxy to vote at our 2018 annual meeting of stockholders, or the 2018 annual meeting. The 2018 annual meeting will be held on Wednesday, June 20, 2018, at 10:00 a.m., local time, at our office located at 505 Eagleview Boulevard, Suite 212, Exton, Pennsylvania 19341. If the 2018 annual meeting is adjourned for any reason, then proxies submitted may be used at any adjournment of the 2018 annual meeting.

This proxy statement summarizes information about the proposals to be considered at the 2018 annual meeting and other information you may find useful in determining how to vote. The proxy card is one means by which you may authorize another person to vote your shares in accordance with your instructions.

We are mailing this proxy statement and the enclosed proxy card to stockholders on or about May 23, 2018.

In this mailing, we are also including copies of our annual report to stockholders for the year ended December 31, 2017, or 2017 Annual Report. Our 2017 Annual Report consists of our annual report on Form 10-K for the year ended December 31, 2017, as filed with the Securities and Exchange Commission, or the SEC, on March 7, 2018, including our audited financial statements, which annual report on Form 10-K is available free of charge on our website, www.iderapharma.com, where it can be accessed by clicking "Investors" and then "SEC Filings," or through the SEC's electronic data system at www.sec.gov. **To obtain directions to be able to attend the 2018 annual meeting and vote in person, write to Investor Relations, Idera Pharmaceuticals, Inc., 167 Sidney Street, Cambridge, Massachusetts 02139, call our toll-free number 1 (877) 888-6550, or email Investor Relations at ir@iderapharma.com.**

**Important Notice Regarding the Availability of
Proxy Materials for the 2018 Annual Meeting
to Be Held on June 20, 2018:**

The Notice of Annual Meeting, Proxy Statement and 2017 Annual Report are available at <http://ir.iderapharma.com/shareholder-services/annual-meeting>.

INFORMATION ABOUT THE 2018 ANNUAL MEETING

Who may vote?

Holders of record of our common stock at the close of business on May 17, 2018, the record date for the 2018 annual meeting, are entitled to vote on each matter properly brought before the 2018 annual meeting. Holders of our common stock will be entitled to one vote for each share of common stock held as of the record date. As of the close of business on May 17, 2018, the record date for the 2018 annual meeting, we had 217,310,991 shares of common stock outstanding.

How do I vote my shares if I am a stockholder of record?

If you are a stockholder of record (meaning that you hold shares in your name in the records of our transfer agent, Computershare Trust Company, N.A., and that your shares are not held in "street name" by a bank or brokerage firm), you may vote your shares in any one of the following ways:

- *You may vote by mail.* To vote by mail, you need to complete, date and sign the proxy card that accompanies this proxy statement and promptly mail it in the enclosed postage-prepaid envelope. You do not need to put a stamp on the enclosed envelope if you mail it from within the United States.
- *You may vote by telephone.* To vote by telephone through services provided by Computershare Trust Company, N.A., call 1-800-652-VOTE (8683), and follow the instructions provided on the proxy card that accompanies this proxy statement. If you vote by telephone, you do not need to complete and mail your proxy card.
- *You may vote over the internet.* To vote over the internet through services provided by Computershare Trust Company, N.A., please go to the following website: <http://www.investorvote.com/IDRA> and follow the instructions at that site for submitting your proxy. If you vote over the internet, you do not need to complete and mail your proxy card.
- *You may vote in person.* If you attend the 2018 annual meeting, you may vote by delivering your completed proxy card in person or you may vote by completing a ballot at the 2018 annual meeting. Ballots will be available at the 2018 annual meeting.

Your proxy will only be valid if you complete and return the proxy card, vote by telephone or vote over the internet at or before the 2018 annual meeting. The persons named in the proxy card will vote the shares you own in accordance with your instructions on your proxy card, in your vote by telephone or in your vote over the internet. If you return the proxy card, vote by telephone or vote over the internet, but do not give any instructions on a particular matter described in this proxy statement, the persons named in the proxy card will vote the shares you own in accordance with the recommendations of our board of directors.

How do I vote my shares if I hold them in "street name?"

If the shares you own are held in "street name" by a bank or brokerage firm, your bank or brokerage firm, as the record holder of your shares, is required to vote your shares according to your instructions. In order to vote your shares, you will need to follow the directions that your bank or brokerage firm provides to you. Many banks and brokerage firms solicit voting instructions over the internet or by telephone.

Under applicable stock exchange rules, banks or brokerage firms subject to these rules that hold shares in street name for customers have the discretion to vote those shares with respect to certain matters if they have not received instructions from the beneficial owners. Banks or brokerage firms will have this discretionary authority with respect to routine or "discretionary" matters. Among the proposals to be presented at the 2018 annual meeting, Proposal Two (approval of a reverse stock split),

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Proposal Three (approval of an amendment setting the number of authorized shares of common stock) and Proposal Five (the ratification of the selection of our independent registered public accounting firm) are discretionary matters, and banks and brokerage firms are permitted to vote your shares even if you have not given voting instructions. Proposal One (the election of directors) and Proposal Four (the approval of a non-binding vote on executive compensation) are non-routine or "non-discretionary" matters, and banks and brokerage firms cannot vote your shares on such proposals if you have not given voting instructions. "Broker non-votes" occur when a bank or brokerage firm submits a proxy for shares but does not indicate a vote for a particular proposal because the bank or brokerage firm either does not have authority to vote on that proposal and has not received voting instructions from the beneficial owner, or has discretionary authority but chooses not to exercise it. The effect of broker non-votes is discussed below in the answer to the question "What vote is required to approve each matter and how will votes be counted?".

Even if your shares are held in street name, you are welcome to attend the 2018 annual meeting. If your shares are held in street name, you may not vote your shares in person at the 2018 annual meeting unless you obtain a proxy, executed in your favor, from the holder of record (i.e., your bank or brokerage firm). If you hold your shares in street name and wish to vote in person, please contact your bank or brokerage firm before the 2018 annual meeting to obtain the necessary proxy from the holder of record.

How may I change or revoke my vote?

If you are a stockholder of record, even if you complete and return a proxy card or vote by telephone or over the internet, you may change or revoke your vote at any time before your proxy is exercised by taking one of the following actions:

- send written notice to our Assistant Secretary, Louis J. Arcudi, III, at our address above, stating that you wish to revoke your vote;
- deliver to us another signed proxy card with a later date or vote by telephone or over the internet at a later date; or
- attend the 2018 annual meeting, notify our Assistant Secretary that you are present and then vote by ballot.

If you own shares in street name, your bank or brokerage firm should provide you with instructions for changing or revoking your vote.

What constitutes a quorum?

In order for business to be conducted at the 2018 annual meeting, a quorum must be present. A quorum consists of the holders of a majority of the shares of our common stock issued, outstanding and entitled to vote at the 2018 annual meeting.

Shares of common stock present in person or represented by proxy (including broker non-votes and shares that are abstained or withheld or with respect to which no voting instructions are provided for one or more of the matters to be voted upon) will be counted for the purpose of determining whether a quorum exists.

If a quorum is not present, the 2018 annual meeting will be adjourned until a quorum is obtained.

What vote is required to approve each matter and how will votes be counted?

The table below sets forth the vote required for each matter being submitted to our stockholders at the 2018 annual meeting to be approved and the effect that abstentions, withheld votes and broker

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non-votes will have on the outcome of voting on each proposal that is being submitted to our stockholders for approval at the 2018 annual meeting.

| <u>Proposal</u> | <u>Affirmative Vote Required</u> | <u>Abstentions/ Withholds</u> | <u>Broker Non-Votes</u> |
|--|--|---------------------------------------|---------------------------------------|
| Election of Directors (<i>Proposal 1</i>) | Plurality of votes cast by holders of common stock entitled to vote | No effect(1) | No effect |
| Approve Reverse Stock Split (<i>Proposal 2</i>) | Majority of issued and outstanding common stock entitled to vote | Has the same effect as a vote AGAINST | Has the same effect as a vote AGAINST |
| Approve Setting Number of Authorized Shares of Common Stock (<i>Proposal 3</i>) | Majority of issued and outstanding common stock entitled to vote | Has the same effect as a vote AGAINST | Has the same effect as a vote AGAINST |
| Advisory Vote on Executive Compensation (<i>Proposal 4</i>) | Majority of common stock present or represented and voting on the matter | No effect | No effect |
| Ratification of Selection of Ernst & Young LLP (<i>Proposal 5</i>) | Majority of common stock present or represented and voting on the matter | No effect | No effect |

(1) You may vote FOR all of the director nominees, WITHHOLD your vote from all of the director nominees or WITHHOLD your vote from any of the director nominees.

Each share of common stock will be counted as one vote.

How does the board of directors recommend that I vote?

Our board of directors recommends that you vote as follows:

- To elect the three nominees to our board of directors (Proposal One); and
- FOR Proposal Two, Proposal Three, Proposal Four and Proposal Five.

Under the Securities Exchange Act of 1934, as amended, or the Exchange Act, and related SEC regulations, the vote on executive compensation, as described in greater detail in Proposal Four, set forth elsewhere in this proxy statement, is an advisory vote, meaning it is non-binding. The vote on the ratification of the selection of Ernst & Young LLP as our independent registered public accounting firm, as described in greater detail in Proposal Five, is also advisory. Our board will carefully consider the outcome of each of these votes.

Will any other business be conducted at the 2018 annual meeting of stockholders?

Our board of directors does not know of any other business to be conducted or matters to be voted upon at the 2018 annual meeting. If any other matter properly comes before the 2018 annual meeting, the persons named in the proxy card that accompanies this proxy statement will exercise their judgment in deciding how to vote or otherwise act with respect to that matter at the 2018 annual meeting.

Who is making and paying for the solicitation of proxies and how is it made?

We are making the solicitation and will bear the costs of soliciting proxies. In addition to solicitations by mail, our directors, officers and employees, without additional remuneration, may solicit proxies by telephone, facsimile, email, personal interviews and other means. We have retained MacKenzie Partners, Inc. to assist in the solicitation of proxies in connection with the 2018 annual meeting for an estimated fee of approximately \$10,000, plus expenses. We have requested that brokerage houses, custodians, nominees and fiduciaries forward copies of the proxy materials to the persons for whom they hold shares and request instructions for voting the proxies. We will reimburse the brokerage houses and other persons for their reasonable out-of-pocket expenses in connection with this distribution.

How and when may I submit a proposal for the 2019 annual meeting of stockholders?

If you are interested in submitting a proposal for inclusion in the proxy statement and proxy card for our 2019 annual meeting of stockholders, or the 2019 annual meeting, you need to follow the procedures outlined in Rule 14a-8 of the Exchange Act. We must receive your proposal intended for inclusion in the proxy statement at our principal executive offices, 167 Sidney Street, Cambridge, Massachusetts 02139, Attention: Secretary, no later than January 23, 2019. SEC rules set standards for the types of stockholder proposals and the information that must be provided by the stockholder making the request.

If you wish to present a proposal at the 2019 annual meeting, but do not wish to have the proposal considered for inclusion in the proxy statement and proxy card or have not complied with the requirements for inclusion of such proposal in our proxy statement under SEC rules, you must also give written notice to us at the address noted above. Our bylaws specify the information that must be included in any such notice, including a brief description of the business to be brought before the annual meeting, the name of the stockholder proposing such business and stock ownership information for such stockholder. In accordance with our bylaws, we must receive this notice at least 60 days, but not more than 90 days, prior to the date of the 2019 annual meeting and the notice must include specified information regarding the proposal and the stockholder making the proposal.

Notwithstanding the foregoing, if we provide less than 70 days' notice or prior public disclosure of the date of the annual meeting to the stockholders, notice by the stockholders must be received by our Secretary no later than the close of business on the tenth day following the date on which the notice of the annual meeting was mailed or such public disclosure was made, whichever occurs first. If a stockholder who wished to present a proposal fails to notify us by this date, the proxies that management solicits for that meeting will have discretionary authority to vote on the stockholder's proposal if it is otherwise properly brought before that meeting. If a stockholder makes timely notification, the proxies may still exercise discretionary authority to vote on stockholder proposals under circumstances consistent with the SEC's rules.

Are annual meeting materials householded?

Some banks and brokerage firms may be participating in the practice of "householding" proxy statements and annual reports. This means that the banks and brokerage firms send only one copy of this proxy statement and the accompanying 2017 Annual Report to multiple stockholders in the same household. Upon request, we will promptly deliver separate copies of this proxy statement and our annual report to stockholders. To make such a request, please call Investor Relations at 1 (877) 888-6550, write to Investor Relations, 167 Sidney Street, Cambridge, Massachusetts 02139 or email Investor Relations at ir@ideraphama.com. To receive separate copies of our annual report to stockholders and proxy statement in the future, or to receive only one copy for the household, please contact us or your bank or brokerage firm.

PROPOSAL ONE
ELECTION OF DIRECTORS

General Information

Our board of directors is divided into three classes and currently consists of three Class I directors: Vincent J. Milano, Kelvin M. Neu, M.D. and William S. Reardon, C.P.A.; three Class II directors: Julian C. Baker, James A. Geraghty and Maxine Gowen, Ph.D.; and one Class III director: Mark Goldberg, M.D. Each member of a class is elected for a three-year term, with the terms staggered so that approximately one-third of our directors stand for election at each annual meeting of stockholders. The Class I, Class II and Class III directors were elected to serve until the annual meeting of stockholders to be held in 2020, 2018 and 2019, respectively, and until their respective successors are elected and qualified.

Our board of directors, on the recommendation of the members of our nominating and corporate governance committee, has nominated Mr. Baker, Mr. Geraghty and Dr. Gowen for election as Class II directors at the 2018 annual meeting. At the 2018 annual meeting, stockholders will be asked to consider the election of Mr. Baker, Mr. Geraghty and Dr. Gowen. Dr. Gowen has been nominated for election as a director at a meeting of our stockholders for the first time. In January 2016, Dr. Gowen was elected to our board of directors as a Class II director by action of our board of directors with a term expiring at our 2018 annual meeting. Dr. Gowen was recommended for initial election to our board of directors by our nominating and corporate governance committee.

The persons named in the enclosed proxy card will vote to elect Mr. Baker, Mr. Geraghty and Dr. Gowen to our board of directors unless you indicate that you withhold authority to vote for the election of any or all nominees. You may not vote for more than three directors. Each Class II director will be elected to hold office until our 2021 annual meeting of stockholders and until his or her successor is elected and qualified or until his or her earlier resignation, death or removal. Each of the nominees is presently a director and each has indicated a willingness to serve as a director, if elected. If a nominee becomes unable or unwilling to serve, however, the persons acting under the proxy may vote for substitute nominees selected by the board of directors.

On January 21, 2018, we entered into an Agreement and Plan of Merger, or the Merger Agreement, with BioCryst Pharmaceuticals, Inc., a Delaware corporation, or BioCryst, Nautilus Holdco, Inc., a Delaware corporation and a wholly owned subsidiary of BioCryst, or Holdco, Island Merger Sub, Inc., a Delaware corporation and a wholly owned subsidiary of Holdco, or Merger Sub A, and Boat Merger Sub, Inc., a Delaware corporation and a wholly owned subsidiary of Holdco, or Merger Sub B. Pursuant to the Merger Agreement, and subject to the satisfaction or waiver of the conditions specified therein, (a) Merger Sub A will be merged with and into us, or the Idera Merger, with us surviving as a wholly owned subsidiary of Holdco, and (b) Merger Sub B will be merged with and into BioCryst, or the BioCryst Merger, which we refer to together with the Idera Merger as the Mergers, with BioCryst surviving as a wholly owned subsidiary of Holdco. We and BioCryst are each planning to hold a special meeting of stockholders to vote on, among other things, the Merger Agreement on July 10, 2018, and, if approved by both our stockholders and BioCryst's stockholders, we expect to consummate the Mergers as soon as practicable thereafter. If the Mergers are consummated, at the effective time of the Mergers and in accordance with the terms of the Merger Agreement, each of Mr. Milano, Dr. Neu, Mr. Reardon, Mr. Baker, Mr. Geraghty, Dr. Gowen and Dr. Goldberg are expected to resign from his or her respective position as a member of our board of directors and any committee thereof. Following the effective time of the Mergers, it is anticipated that Messrs. Milano and Geraghty and Drs. Goldberg and Gowen will serve as members of Holdco's board of directors.

Information about our Directors

Set forth below are the names of each of the nominees for election to our board of directors, the names of each of our other continuing directors, the year in which each director first became a director, their age as of April 30, 2018, their positions and offices with our Company, their principal occupations and business experience during at least the past five years and the names of other public companies for which they currently serve, or have served within the past five years, as a director. We have also included information about each director's specific experience, qualifications, attributes or skills that led our board of directors to conclude that such individual should serve as one of our directors. We also believe that all of our directors have a reputation for integrity, honesty and adherence to high ethical standards. They each have demonstrated business acumen and an ability to exercise sound judgment, as well as a commitment of service to Idera and our board of directors.

Recommendation of the Board of Directors

Our board of directors unanimously recommends that the stockholders vote FOR the election of Mr. Baker, Mr. Geraghty and Dr. Gowen as Class II directors.

Class II Nominees—Terms to Expire in 2018

Julian C. Baker

Director since 2014

Mr. Baker, age 51, is a Managing Partner of Baker Brothers Investments, which he founded in 2000 with his brother, Dr. Felix J. Baker. The firm primarily manages long-term investment funds focused on publicly traded life sciences companies. Mr. Baker's career as a fund manager began in 1994 when he co-founded a biotechnology investing partnership with his brother and the Tisch Family. Previously, Mr. Baker was employed from 1988 to 1993 by the private equity investment arm of Credit Suisse First Boston Corporation. He also serves on the boards of directors of Acadia Pharmaceuticals, Inc., Incyte Corporation and Genomic Health, Inc. and previously served on the board of directors of Trimeris, Inc. Mr. Baker holds an A.B. from Harvard University. We believe that Mr. Baker's qualifications to sit on our board of directors include his financial expertise, affiliation with one of our significant stockholders, knowledge of our industry and significant public company board experience.

James A. Geraghty

Director since 2013

Mr. Geraghty, age 63, has served as chairman of our board of directors since July 2013. He was an Entrepreneur in Residence at Third Rock Ventures from May 2013 to October 2016. Mr. Geraghty served as a Senior Vice President of Sanofi, a global healthcare company, from April 2011 to December 2012. Prior to that, he served in various senior management roles at Genzyme Corporation, a biotechnology company, from 1992 to April 2011, including as Senior Vice President, International Development from January 2007 to April 2011. Mr. Geraghty currently serves as chairman of the board of Juniper Pharmaceuticals, Inc., a publicly traded company, and as a member of the board of Voyager Therapeutics, Inc., a publicly traded company. He also serves as a director of Fulcrum Therapeutics, Inc. He previously served as a director of bluebird bio Inc. and GTC Biotherapeutics, Inc. We believe that Mr. Geraghty's qualifications to sit on our board of directors include his public company board and management experience and his broad and deep knowledge of the industry in which we operate.

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Maxine Gowen, Ph.D.

Director since 2016

Dr. Gowen, age 59, has served as the founding President and CEO and a member of the board of directors of Trevena, Inc., a biopharmaceutical company, since November 2007. Prior to joining Trevena, Dr. Gowen was Senior Vice President for the Center of Excellence for External Drug Discovery at GlaxoSmithKline plc, or GSK, where she held a variety of leadership positions during her tenure of 15 years. Before GSK, Dr. Gowen was Senior Lecturer and Head, Bone Cell Biology Group, Department of Bone and Joint Medicine, of the University of Bath, U.K. Dr. Gowen has served as a director of Akebia Therapeutics, Inc., a publicly traded company, since July 2014. From 2008 until 2012, Dr. Gowen served as a director of Human Genome Sciences, Inc., a publicly traded company. She received her Ph.D. from the University of Sheffield, U.K., an M.B.A. with academic honors from The Wharton School of the University of Pennsylvania, and a B.Sc. with Honors in Biochemistry from the University of Bristol, U.K. We believe that Dr. Gowen's qualifications to sit on our board of directors include her significant public company management and board experience and knowledge of our industry.

Class I Directors—Terms to Expire in 2020

Vincent J. Milano

Director since 2014

Vincent Milano, age 54, has been our President and Chief Executive Officer, and a member of our board of directors, since December 2014. Prior to joining us, Mr. Milano served as Chairman, President and Chief Executive Officer of ViroPharma Inc., a pharmaceutical company that was acquired by Shire Plc in January 2014, from March 2008 to January 2014, as its Vice President, Chief Financial Officer and Chief Operating Officer from January 2006 to March 2008 and as its Vice President, Chief Financial Officer and Treasurer from April 1996 to December 2005. Mr. Milano also served on the board of directors of ViroPharma from March 2008 to January 2014. Prior to joining ViroPharma, Mr. Milano served in increasingly senior roles, most recently senior manager, at KPMG LLP, an independent registered public accounting firm, from July 1985 to March 1996. Mr. Milano currently serves on the board of directors of Spark Therapeutics, Inc. and Vanda Pharmaceuticals Inc., each a publicly traded company, and VenatoRx Pharmaceuticals, Inc. Mr. Milano holds a Bachelor of Science degree in Accounting from Rider College. We believe Mr. Milano's qualifications to sit on our board of directors include his knowledge of our company as our President and Chief Executive Officer, knowledge of our industry, including over 20 years of experience serving in a variety of roles of increasing responsibility in the finance department, corporate administration and operations of a multinational biopharmaceutical company, and understanding of pharmaceutical research and development, sales and marketing, strategy, and operations in both the United States and overseas. He also has corporate governance experience through service on other public company boards.

Kelvin M. Neu, M.D.

Director since 2014

Dr. Neu, age 44, is a Managing Director of Baker Bros. Advisors LP and has been with the firm since 2004. The firm primarily manages long-term investment funds focused on publicly traded life sciences companies. Dr. Neu previously served on the board of directors of XOMA Corporation, a publicly traded company. Dr. Neu also served as a director of AnorMED Inc. and diaDexus, Inc. Dr. Neu holds an A.B. in Molecular Biology from Princeton University and an M.D. from Harvard Medical School and the Harvard-MIT Division of Health Sciences and Technology. He also trained for three years in the Immunology Ph.D. program at Stanford University. We believe that Dr. Neu's qualifications to sit on our board of directors include his scientific background, affiliation with one of our significant stockholders and knowledge of our industry.

William S. Reardon, C.P.A.

Director since 2002

Mr. Reardon, age 71, has been a director since 2002 and served as lead independent director of our board of directors from September 2010 to July 2013. He served as an audit partner at PricewaterhouseCoopers LLP, where he led the Life Science Industry Practice for New England and the Eastern United States from 1986 until his retirement from the firm in July 2002. Mr. Reardon currently serves as a trustee of closed-end mutual funds Tekla Healthcare Investors, Tekla Life Sciences Investors and of Tekla Healthcare Opportunities Fund and Tekla World Healthcare Fund. Mr. Reardon also previously served as a director of Synta Pharmaceuticals Corp., a publicly traded company. We believe that Mr. Reardon's qualifications to sit on our board of directors include his accounting and financial experience, including as a partner at a leading accounting firm leading its life science practice, his role in keeping the board of directors and senior management team abreast of current accounting regulations and his experience as a member of several boards of directors of biotechnology companies. Additionally, we value Mr. Reardon's role in leading the board on matters of corporate governance, before, during and after his service as lead independent director.

Class III Directors—Terms to Expire in 2019

Mark Goldberg, M.D.

Director since 2014

Dr. Goldberg, age 63, served as consultant and medical and regulatory strategist for Synageva BioPharma Corp., a biopharmaceutical company, from October 2014 until June 2015. Prior to that, he served as the Executive Vice President for Medical and Regulatory Strategy of Synageva from January 2014 to October 2014 and as the Senior Vice President of Medical and Regulatory Affairs of Synageva from September 2011 to January 2014. Dr. Goldberg served in a variety of senior management positions at Genzyme Corporation from 1996 to July 2011, including most recently as Senior Vice President for Clinical Development and Therapeutic Group Head for Oncology and Personalized Genetic Health from 2009 to July 2011. Prior to working at Genzyme Corporation, he was a full-time staff physician at Brigham and Women's Hospital and Dana Farber Cancer Institute, where he still holds appointments. He has also been an Associate Professor of Medicine at Harvard Medical School since 1996. Dr. Goldberg is a board-certified medical oncologist and hematologist and has more than 50 published papers. Dr. Goldberg currently serves on the board of directors of ImmunoGen, Inc. GlycoMimetics, Inc., Blueprint Medicines Corporation and Audentes Therapeutics, Inc., all publicly traded companies. He also served on the board of directors of aTyr Pharma, Inc. from 2015 to 2017. Dr. Goldberg holds an A.B. from Harvard College and an M.D. from Harvard Medical School. We believe that Dr. Goldberg's qualifications to sit on our board of directors include his extensive scientific and medical background, public company board experience and extensive experience in the management and operations of pharmaceutical companies.

Director Compensation

We use a combination of cash and equity-based compensation to attract and retain candidates to serve on our board of directors. We do not compensate directors who are also our employees for their service on our board of directors. As a result, Mr. Milano does not, and Dr. Sudhir Agrawal, our former director and President of Research, did not, receive any compensation for their service on our board of directors.

We generally review our director compensation program every two years with the advice of an independent compensation consultant. In November 2016, we modified our director compensation program, effective January 1, 2017.

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Under our director compensation program, we pay our non-employee directors retainers in cash. Each director receives a cash retainer for service on the board of directors and for service on each committee on which the director is a member. The chairmen of each committee receive higher retainers for such service. These fees are paid quarterly in arrears. The fees paid to non-employee directors for service on the board of directors and for service on each committee of the board of directors on which the director was a member during 2017 were as follows:

| | <u>Member Annual Fee</u> | <u>Chairman Annual Fee</u> |
|---|------------------------------|--------------------------------|
| Board of Directors | \$ 35,000 | \$ 70,000 |
| Audit Committee | \$ 7,500 | \$ 15,000 |
| Compensation Committee | \$ 6,250 | \$ 12,500 |
| Nominating and Corporate Governance Committee | \$ 4,000 | \$ 8,000 |

Our director compensation program includes a stock-for-fees policy, under which directors have the right to elect to receive common stock in lieu of cash fees. These shares of common stock are issued under our 2013 Stock Incentive Plan. The number of shares issued to participating directors is determined on a quarterly basis by dividing the cash fees to be paid through the issuance of common stock by the fair market value of our common stock, which is the closing price of our common stock, on the first business day of the quarter following the quarter in which the fees are earned. In 2017, several of our directors elected to receive shares of our common stock in lieu of cash fees as set forth in the footnotes to the Director Compensation table below. No other director elected to receive shares of our common stock in lieu of cash fees during 2017.

Under our director compensation program, we also reimburse our directors for travel and other related expenses for attendance at meetings.

Under our current director compensation program, upon their initial election to the board of directors, new non-employee directors receive an initial option grant to purchase 100,000 shares of our common stock, and all non-employee directors, other than the chairman, receive an annual option grant to purchase 50,000 shares of our common stock. The chairman receives an annual option grant for 63,000 shares of our common stock. The annual grants are made on the date of our annual meeting of stockholders and fully vest one year from that date of grant. The initial options granted to our non-employee directors vest with respect to one third of the underlying shares on the first anniversary of the date of grant and the balance of the underlying shares vest in eight equal quarterly installments following the first anniversary of the date of grant, subject to continued service as a director, and are granted under our 2013 Stock Incentive Plan. These options are granted with exercise prices equal to the fair market value of our common stock, which is the closing price of our common stock, on the date of grant and will become immediately exercisable in full if there is a change in control of our company.

Under our retirement policy for non-employee members of the board of directors, if a non-employee director is deemed to retire, then:

- all outstanding options held by such director will automatically vest in full; and
- the period during which such director may exercise the options will be extended to the expiration of the option under the plan.

Under the policy, a non-employee director will be deemed to have retired if:

- the director resigns from the board of directors or determines not to stand for re-election or is not nominated for re-election at a meeting of our stockholders and has served as a director for more than 10 years; or

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- the director does not stand for re-election or is not nominated for re-election due to the fact that he or she is or will be older than 75 at the end of such director's term.

The following table sets forth a summary of the compensation we paid to our non-employee directors who served on our board in 2017.

DIRECTOR COMPENSATION FOR 2017

| <u>Name</u> | <u>Fees Earned or Paid in Cash (\$)</u> | <u>Option Awards \$(1)</u> | <u>All Other Compensation (\$)</u> | <u>Total (\$)</u> |
|--------------------|---|------------------------------------|--|-----------------------|
| Julian C. Baker | 35,000(2) | 55,915 | — | 90,915 |
| James A. Geraghty | 85,500 | 70,452 | — | 155,952 |
| Mark Goldberg | 42,500 | 55,915 | — | 98,415 |
| Maxine Gowen | 41,250 | 55,915 | — | 97,165 |
| Kelvin M. Neu | 47,500(3) | 55,915 | — | 103,415 |
| William S. Reardon | 54,000(4) | 55,915 | — | 109,915 |
| Youssef El Zein(5) | 36,889(6) | 55,915 | — | 92,803 |

- (1) These amounts represent the aggregate grant date fair value of option awards made to each listed director in 2017 as computed in accordance with Financial Accounting Standards Board Accounting Standards Codification Topic 718, "Stock Compensation," or ASC 718. These amounts do not represent the actual amounts paid to or realized by the directors during 2017. See Note 10 to the financial statements included in our Annual Report on Form 10-K for the year ended December 31, 2017 regarding assumptions we made in determining the fair value of option awards. As of December 31, 2017, our non-employee directors, or former director in the case of Mr. El Zein, held options to purchase shares of our common stock as follows: Mr. Baker: 225,000; Mr. Geraghty: 710,500; Dr. Goldberg: 225,000; Dr. Gowen: 155,000; Dr. Neu: 225,000; Mr. Reardon: 302,250; and Mr. El Zein: 302,250.
- (2) Includes cash meeting fees of \$35,000 in lieu of which Mr. Baker elected to receive 16,398 shares of our common stock.
- (3) Includes cash meeting fees of \$47,500 in lieu of which Dr. Neu elected to receive 22,254 shares of our common stock.
- (4) Includes cash meeting fees of \$13,500 in lieu of which Mr. Reardon elected to receive 7,714 shares of our common stock.
- (5) Mr. El Zein resigned from our board of directors on October 24, 2017.
- (6) Consists of cash meeting fees in lieu of which Mr. El Zein elected to receive 16,573 shares of our common stock.

In January 2018, we formed a scientific committee of the board of directors and the annual member fee paid to non-employee directors for their service on such committee will be \$4,000.

CORPORATE GOVERNANCE INFORMATION

Board of Directors

Our board of directors is responsible for establishing our broad corporate policies and overseeing the management of our company. Our chief executive officer and our other executive officers are responsible for our day-to-day operations. Our board evaluates our corporate performance and approves, among other things, our corporate strategies and objectives, operating plans, major

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commitments of corporate resources and significant policies. Our board also evaluates and appoints our executive officers.

Our board of directors met 12 times during 2017, including regular, special and telephonic meetings. Each director who served as a director during 2017 attended at least 75% of the total number of board meetings held during 2017 while he or she was a director and of the total number of meetings held by all board committees on which he or she served during 2017.

Directors are responsible for attending our annual meetings of stockholders. Seven of our directors attended the 2017 annual meeting of stockholders in person.

Board Leadership Structure

Our board of directors does not have a policy on whether the offices of chairman of the board of directors and chief executive officer should be separate and, if they are to be separate, whether the chairman of the board of directors should be selected from among the independent directors or should be an employee of our company. Our board of directors believes that it should have the flexibility to make these determinations at any given point in time in the way that it believes best to provide appropriate leadership for our company at that time. Currently, Mr. Geraghty serves as chairman of our board of directors and Mr. Milano serves as chief executive officer. Our board of directors believes that this separation allows our chief executive officer to focus on our day-to-day business, while allowing the chairman of the board of directors to lead the board of directors in its fundamental role of providing advice to and independent oversight of management.

Our board of directors recognizes that no single leadership model is right for all companies and at all times and that depending on the circumstances, other leadership models, such as a combined chairman and chief executive officer, might be appropriate. Accordingly, the board of directors periodically reviews its leadership structure. Pursuant to our corporate governance guidelines, if the chairman is not an independent director, the board of directors may elect a lead director from its independent directors. In such case, the chairman and chief executive officer would consult periodically with the lead director on board of directors matters and on issues facing our company. In addition, the lead director would serve as the principal liaison between the chairman of the board of directors and the independent directors and would preside at any executive session of independent directors.

Board of Directors' Role in Risk Oversight

Our board of directors, as a whole, has responsibility for risk oversight, with reviews of certain areas being conducted by relevant committees that report directly to the board of directors. The oversight responsibility of the board of directors and its committees is enabled by management reporting processes that are designed to provide visibility to the board of directors about the identification, assessment and management of critical risks and management's risk mitigation strategies. These areas of focus include competitive, economic, operational, financial (accounting, credit, liquidity and tax), legal, regulatory, compliance, health, safety, environmental, political and reputational risks. Our board of directors regularly reviews information regarding our strategy, operations, credit and liquidity, as well as the risks associated with each. Our compensation committee is responsible for overseeing risks relating to our executive compensation plans and arrangements. Our audit committee is responsible for overseeing financial risks and risks associated with related party transactions. Our nominating and corporate governance committee is responsible for overseeing risks associated with the independence of the board of directors. While each committee is responsible for evaluating certain risks and overseeing the management of such risks, our entire board of directors is regularly informed through committee reports about such risks.

Board Committees

Our board of directors has established three standing committees: audit, compensation and nominating and corporate governance. Each of our audit, compensation and nominating and corporate governance committees operates under a charter that has been approved by our board of directors. Our board of directors has also adopted corporate governance guidelines to assist our board of directors in the exercise of its duties and responsibilities. Current copies of the charters for the audit, compensation and nominating and corporate governance committees and the corporate governance guidelines are posted on our website, www.iderapharma.com, and can be accessed by clicking "Investors" and "Corporate Governance."

Audit Committee

Our audit committee's responsibilities include:

- appointing, approving the compensation of, and assessing the independence of our independent registered public accounting firm;
- overseeing the work of our independent registered public accounting firm, including through the receipt and consideration of certain reports from such accounting firm;
- reviewing and discussing with management and our independent registered public accounting firm our annual and quarterly financial statements and related disclosures;
- monitoring our internal control over financial reporting, disclosure controls and procedures and code of business conduct and ethics;
- discussing our risk management policies;
- establishing procedures for the receipt and retention of accounting related complaints and concerns;
- reviewing and approving related party transactions;
- meeting independently with our independent registered public accounting firm and management; and
- preparing the audit committee report required by SEC rules.

The current members of our audit committee are Mr. Reardon (Chairman), Mr. Geraghty and Dr. Goldberg. Our board of directors has determined that Mr. Reardon is an "audit committee financial expert" within the meaning of SEC rules and regulations. During 2017, our audit committee held seven meetings in person or by teleconference.

Compensation Committee

Our compensation committee's responsibilities include:

- annually reviewing and approving corporate goals and objectives relevant to compensation for our executive officers;
- determining the compensation of our senior executives;
- overseeing the evaluation of our senior executives;
- overseeing and administering our cash and equity incentive plans;
- reviewing and making recommendations to the board of directors with respect to director compensation;
- reviewing and discussing annually with management the compensation discussion and analysis required by the SEC rules and included in this proxy statement; and
- preparing the compensation committee report required by SEC rules.

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The current members of our compensation committee are Dr. Neu (Chairman) and Dr. Gowen. During 2017, the compensation committee held six meetings in person or by teleconference.

The processes and procedures followed by our compensation committee in considering and determining executive compensation are described below under the heading "Executive Compensation."

Nominating and Corporate Governance Committee

Our nominating and corporate governance committee's responsibilities include:

- identifying individuals qualified to become members of our board of directors;
- recommending to our board of directors the persons to be nominated for election as directors or to fill vacancies on our board of directors, and the persons to be appointed to each of the committees of the board of directors;
- reviewing and making recommendations to the board of directors with respect to management succession planning;
- developing and recommending to the board of directors corporate governance principles; and
- overseeing periodic evaluations of the board of directors.

The current members of our nominating and corporate governance committee are Mr. Geraghty (Chairman) and Mr. Reardon. During 2017, the nominating and corporate governance committee held six meetings in person or by teleconference.

The processes and procedures followed by our nominating and corporate governance committee in identifying and evaluating director candidates are described below under the heading "Director Nomination Process."

Director Independence

Under applicable rules of the Nasdaq Stock Market, or Nasdaq, a director will only qualify as an "independent director" if, in the opinion of our board of directors, that person does not have a relationship which would interfere with the exercise of independent judgment in carrying out the responsibilities of a director. Our board of directors has determined that Mr. Baker, Mr. Geraghty, Dr. Goldberg, Dr. Gowen, Dr. Neu and Mr. Reardon and all of the members of each of the audit, compensation and nominating and corporate governance committees are independent as defined under applicable rules of the Nasdaq including, in the case of all members of the audit committee, the independence requirements contemplated by Rule 10A-3 under the Exchange Act and, in the case of all members of the compensation committee, the independence requirements contemplated by Rule 10C-1 under the Exchange Act.

Our board of directors had previously made a similar determination of independence with respect to Mr. El Zein, who served as a director until October 2017.

Director Nomination Process

The process followed by our nominating and corporate governance committee to identify and evaluate director candidates includes requests to members of our board of directors and others for recommendations, meetings from time to time to evaluate biographical information and background material relating to potential candidates and interviews of selected candidates by members of our nominating and corporate governance committee and our board of directors. The nominating and corporate governance committee has from time to time used a third-party recruiting firm to identify and interview potential candidates.

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In considering whether to recommend any particular candidate for inclusion in the board of director's slate of recommended director nominees, the nominating and corporate governance committee will apply the criteria set forth in our corporate governance guidelines. These criteria include the candidate's:

- business acumen;
- knowledge of our business and industry;
- age;
- experience;
- diligence;
- conflicts of interest;
- ability to act in the interests of all stockholders; and
- in the case of the renomination of existing directors, performance on our board of directors and on any committee of which the director was a member.

Our corporate governance guidelines also provide that candidates should not be discriminated against on the basis of race, religion, national origin, sex, sexual orientation, disability or any other basis proscribed by law and that our nominating and corporate governance committee should consider the value of diversity of the board of directors when evaluating particular candidates. The committee has not adopted any formal or informal diversity policy and treats diversity as one of the criteria to be considered by the committee. The committee does not assign specific weights to particular criteria that the committee reviews and no particular criterion is a prerequisite for the consideration of any prospective nominee. We believe that the backgrounds and qualifications of our directors, considered as a group, should provide a composite and diverse mix of experience, knowledge and abilities that will allow the board of directors to fulfill its responsibilities.

Stockholder Nominees

Stockholders may recommend individuals to the nominating and corporate governance committee for consideration as potential director candidates by submitting the individuals' name, together with appropriate biographical information and background materials and a statement as to whether the stockholder or group of stockholders making the recommendation has beneficially owned more than 5% of our common stock for at least one year as of the date such recommendation is made, to Nominating and Corporate Governance Committee, c/o Secretary, Idera Pharmaceuticals, Inc., 167 Sidney Street, Cambridge, Massachusetts 02139. Assuming that appropriate biographical and background material has been provided on a timely basis, the nominating and corporate governance committee will evaluate stockholder-recommended candidates by following substantially the same process, and applying substantially the same criteria, as it follows for candidates submitted by others. If the board of directors determines to nominate a stockholder-recommended candidate and recommends his or her election, then his or her name will be included in our proxy card for the next annual meeting.

Stockholders also have the right under our bylaws to nominate director candidates directly, without any action or recommendation on the part of the nominating and corporate governance committee or the board of directors, by following the procedures set forth in our bylaws, including advance notice requirements. Candidates nominated by stockholders in accordance with the procedures set forth in our bylaws will not be included in our proxy card for the next annual meeting. See "Information about the 2018 annual meeting—How and when may I submit a proposal for the 2019 annual meeting of stockholders?" for more information about these procedures.

Communicating with our Board of Directors

Our board of directors will give appropriate attention to written communications that are submitted by stockholders and will respond if and as appropriate. The chairman of the board of directors (if an independent director) or the lead independent director, if any, is primarily responsible for monitoring communications from stockholders and for providing copies or summaries to the other directors, as he or she considers appropriate.

Communications are forwarded to all directors if they relate to important substantive matters and include suggestions or comments that the chairman of the board of directors or lead independent director, as the case may be, considers to be important for the directors to know. In general, communications relating to corporate governance and long-term corporate strategy are more likely to be forwarded than communications relating to ordinary business affairs, personal grievances and matters that involve repetitive or duplicative communications.

Stockholders who wish to send communications on any topic to the board of directors should address such communications to Board of Directors, c/o Secretary, Idera Pharmaceuticals, Inc., 167 Sidney Street, Cambridge, Massachusetts 02139.

Each communication from a stockholder should include the following information in order to permit stockholder status to be confirmed and to provide an address to forward a response if deemed appropriate:

- the name, mailing address and telephone number of the stockholder sending the communication;
- the number of shares held by the stockholder; and
- if the stockholder is not a record owner of our securities, the name of the record owner of our securities beneficially owned by the stockholder.

Compensation Committee Interlocks and Insider Participation

Our compensation committee currently consists of Dr. Neu and Dr. Gowen, who were both members of our compensation committee throughout 2017. In 2017, Mr. El Zein was a member of our compensation committee from January until October when he resigned from our board of directors. No member of our compensation committee was at any time during 2017, or was formerly, an officer or employee of ours. No member of our compensation committee engaged in any related person transaction involving our company during 2017 other than Dr. Neu and Mr. El Zein. See "Transactions with Related Persons" for information about the terms of the transactions we engaged in with affiliates of Dr. Neu and Mr. El Zein. None of our executive officers has served as a director or member of the compensation committee (or other committee serving the same function as the compensation committee) of any other entity, while an executive officer of that other entity served as a director or member of our compensation committee.

Our Executive Officers

Our executive officers and their respective ages and positions as of April 30, 2018 are described below. Our executive officers serve until they resign or the board of directors terminates their position.

| Name | Age | Position |
|------------------------------|-----|---|
| Vincent J. Milano* | 54 | President and Chief Executive Officer |
| Louis J. Arcudi, III, M.B.A. | 57 | Senior Vice President of Operations, Chief Financial Officer, Treasurer and Assistant Secretary |
| R. Clayton Fletcher | 55 | Senior Vice President, Business Development and Strategy |
| Joanna Horobin, M.B., Ch.B | 63 | Senior Vice President, Chief Medical Officer |
| Jonathan Yingling, Ph.D. | 49 | Senior Vice President, Chief Scientific Officer |

* Mr. Milano is a member of our board of directors. See "Information about our Directors" above for more information about Mr. Milano.

Louis J. Arcudi, III, M.B.A., has been our Senior Vice President of Operations since April 2011 and our Chief Financial Officer and Treasurer since he joined us in December 2007. Mr. Arcudi served as our Secretary from December 2007 until June 2015 and has been our Assistant Secretary since June 2015. Prior to joining us, Mr. Arcudi served as Vice President of Finance and Administration and Treasurer for Peptimmune, Inc., a biotechnology company, from 2003 to 2007. From 2000 to 2003, Mr. Arcudi was Senior Director of Finance and Administration at Genzyme Molecular Oncology Corporation, a division of Genzyme Corporation. He was Director of Finance Business Planning and Operations International at Genzyme from 1998 to 2000. Prior to joining Genzyme, he held finance positions with increasing levels of responsibility at Cognex Corporation, a supplier of machine vision systems, Millipore Corporation, a provider of technologies, tools and services for bioscience, research and biopharmaceutical manufacturing, and General Motors Corporation, an automobile manufacturer. Mr. Arcudi holds an M.B.A. from Bryant College and a B.S. in accounting and information systems from the University of Southern New Hampshire.

R. Clayton Fletcher has been our Senior Vice President, Business Development and Strategic Planning since January 2015. Prior to joining us, Mr. Fletcher served in increasingly senior positions at ViroPharma Inc., which was acquired by Shire Plc in January 2014, from April 2001 until January 2014, including as Vice President, Business Development and Project Management from 2005 until January 2014. Mr. Fletcher served as Senior Project Manager at SmithKline Beecham plc, a pharmaceutical company, which was purchased by Glaxo Wellcome plc in December 2000, from 1997 until 2001. Prior to working at SmithKline Beecham, he served as Project Scientist, at Becton, Dickinson and Company, a medical devices company and as Principal Scientist at Intracel Corporation, a biopharmaceutical company. Prior to working at Intracel, he served as Senior Associate Scientist at Centocor Biotech, Inc., a biotechnology company from 1991 until 1993. Mr. Fletcher holds a B.S. and a M.S. in biology from Wake Forest University.

Joanna Horobin, M.B., Ch.B., has been our Senior Vice President and Chief Medical Officer since November 2015. Prior to joining us, Dr. Horobin served as the Chief Medical Officer of Verastem, Inc., a biopharmaceutical company, from October 2012 to June 2015. Prior to joining Verastem, she served as President of Syndax Pharmaceuticals, a biopharmaceutical company, from September 2006 to October 2012 and as Chief Executive Officer from September 2006 until April 2012. Prior to that, Dr. Horobin held several roles of increasing responsibility at global pharmaceutical corporations such as Rhône-Poulenc Rorer (now Sanofi) and Chugai-Rhône-Poulenc. Dr. Horobin received her medical degree from the University of Manchester, England.

Jonathan Yingling, Ph.D., joined our company as Senior Vice President, Early Development in February 2017 and since January 2018 has been serving as our Chief Scientific Officer. Prior to joining us, Dr. Yingling was Chief Scientific Officer at Bind Therapeutics Inc., a biotechnology company that filed for bankruptcy in May 2016, from December 2015 to August 2016. Prior to joining Bind Therapeutics, Dr. Yingling served as vice president, Oncology Discovery and Translational Research at Bristol-Myers Squibb Company, or BMS, a pharmaceutical company, from June 2013 to October 2015. During his tenure at BMS, he was responsible for the oncology research portfolio as well as translational capabilities in immuno-oncology. Dr. Yingling earned his Ph.D. in Cell and Molecular Biology and Pharmacology at Duke University and was a Howard Hughes Postdoctoral Fellow at Vanderbilt University.

SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT

The following table sets forth, as of April 30, 2018, certain information regarding the beneficial ownership of our common stock by:

- each person or entity, including any "group" as that term is used in Section 13(d)(3) of the Exchange Act, who is known to own beneficially more than 5% of the issued and outstanding shares of our common stock;
- each of our current directors;
- each of our named executive officers, as defined in "Executive Compensation—Compensation Discussion and Analysis" below; and
- all of our current directors and executive officers as a group.

We have determined beneficial ownership in accordance with the rules of the SEC, and the information in the table below is not necessarily indicative of beneficial ownership for any other purpose. The SEC has defined "beneficial ownership" of a security to mean the possession, directly or indirectly, of voting power and/or investment power. In computing percentage ownership of each person, shares of common stock subject to options, warrants or rights held by that person that are currently exercisable, or exercisable within 60 days of April 30, 2018, are deemed to be outstanding and beneficially owned by that person. These shares, however, are not deemed outstanding for the purpose of computing the percentage ownership of any other person.

To our knowledge and except as indicated in the notes to this table and pursuant to applicable community property laws, each stockholder named in the table has sole voting and investment power with respect to the shares set forth opposite such stockholder's name. Percentage of ownership is based

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on 217,310,991 shares of our common stock issued and outstanding on April 30, 2018. All fractional common share amounts have been rounded to the nearest whole number.

| Name and Address of Beneficial Owner(1) | Number of Shares Beneficially Owned | Percentage of Outstanding Shares |
|---|---|--|
| 5% or more Stockholders | | |
| Pillar Investment Entities c/o Pillar Invest Offshore SAL Starco Ctr Bloc B, 3rd Flr Omar Daouk St. Beirut, M8 2020-3313 | 26,898,574(2) | 12.36% |
| Affiliates of Baker Bros. Advisors LP 860 Washington Street, 3rd Floor, New York, NY 10014 | 39,081,479(3) | 17.95% |
| Named Executive Officers and Directors | | |
| Vincent J. Milano | 2,259,027(4) | 1.03% |
| Sudhir Agrawal, D. Phil. | 4,029,468(5) | 1.82% |
| Louis J. Arcudi, III | 1,420,748(6) | * |
| Julian C. Baker | 39,081,479(7) | 17.95% |
| R. Clayton Fletcher | 649,374(8) | * |
| James A. Geraghty | 1,128,370(9) | * |
| Mark Goldberg | 213,334(10) | * |
| Maxine Gowen | 132,834(11) | * |
| Joanna Horobin | 435,625(12) | * |
| Kelvin M. Neu | 294,966(13) | * |
| William S. Reardon | 306,307(14) | * |
| Jonathan Yingling | 187,499(15) | * |
| All current executive officers and directors as a group (11 persons) | 45,814,597(16) | 20.48% |

* Denotes less than 1% beneficial owner.

- (1) Except as otherwise noted, the address for each person listed above is c/o Idera Pharmaceuticals, Inc., 167 Sidney Street, Cambridge, Massachusetts 02139.
- (2) Consists of (i) 2,090,125 shares of common stock held by Pillar Pharmaceuticals I, L.P., or Pillar I, (ii) 9,959,956 shares of common stock held by Pillar Pharmaceuticals II, L.P., or Pillar II, (iii) 2,871,839 shares of common stock held by Pillar Pharmaceuticals III, L.P., or Pillar III, (iv) 200,000 shares of common stock held by Pillar Pharmaceuticals IV, L.P., or Pillar IV, (v) 875,000 shares of common stock held by Pillar V, (vi) 10,075,973 shares of common stock held by Participations Besancon, or Besancon, and over which Pillar Invest Corporation has investment discretion, pursuant to an advisory agreement between Pillar Invest Corporation and Besancon, or the Advisory Agreement, (vii) 540,681 shares of common stock held directly by Mr. El Zein and (viii) 285,000 shares of common stock subject to issued outstanding stock options that are exercisable within 60 days after April 30, 2018 held by Mr. El Zein. Mr. El Zein, a member of our board of directors until October 31, 2017, is a director and controlling stockholder of Pillar Invest Corporation, which is the general partner of Pillar I, Pillar II, Pillar III, Pillar IV and Pillar V and is a limited partner of Pillar I, Pillar II, Pillar III, Pillar IV and Pillar V. Mr. El Zein expressly disclaims beneficial ownership over shares held directly by Pillar I, Pillar II, Pillar III, Pillar IV, Pillar V and indirectly by Pillar Invest Corporation. Besancon is an investment fund having no affiliation with Mr. El Zein, Pillar I, Pillar II, Pillar III, Pillar IV, Pillar V or Pillar Invest Corporation. The information in this footnote is based on a Schedule 13D/A filed with the SEC on October 17, 2016; Form 4s filed with the

SEC on May 3, 2017, October 17, 2017, December 15, 2017, January 19, 2018 and April 27, 2018; and on information provided to us by Pillar Invest Corporation and Mr. El Zein.

- (3) Consists of (i) 3,974,070 shares of our common stock owned by 667, L.P., (ii) 34,064,525 shares of our common stock owned by Baker Brothers Life Sciences, L.P., (iii) 474,141 shares of our common stock owned by 14159, L.P., (iv) (a) 60,443 shares of our common stock held directly by Mr. Baker and (b) 81,632 shares of our common stock held directly by Dr. Neu, and in which each of 667, L.P., Baker Brothers Life Sciences, L.P. and 14159, L.P. (collectively, the "Baker Brothers Funds"), has an indirect pecuniary interest and may be deemed to own a portion of these shares, and (v) (a) 213,334 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018 held by Mr. Baker and (b) 213,334 shares of common stock subject to outstanding options that are exercisable within 60 days after April 30, 2018 held by Dr. Neu. As a result of the application of the Beneficial Ownership Cap, as described below in this footnote, the table above does not include the following as being beneficially owned by the Baker Brothers Funds: (a) 2,389,927 shares of common stock issuable upon exercise of warrants to purchase common stock owned by 667, L.P., (b) 19,280,570 shares of common stock issuable upon exercise of warrants to purchase common stock owned by Baker Brothers Life Sciences, L.P. and (c) 480,555 shares of common stock issuable upon exercise of warrants to purchase common stock owned by 14159, L.P. The information in this footnote is based on a Schedule 13D/A filed with the SEC on March 6, 2018; a Form 4 filed with the SEC on April 4, 2018; and on information provided to us by the Baker Brothers Funds and Mr. Baker. Mr. Baker, a member of our board of directors, is a managing member of Baker Bros. Advisors LP and is a principal of Baker Bros. Advisors (GP), LLC, the sole general partner of Baker Bros. Advisors LP. Baker Bros. Advisors LP serves as the investment advisor to the Baker Brothers Funds. Accordingly, Mr. Baker may be deemed to have sole power to direct the voting and disposition of the shares of common stock held directly by the Baker Brothers Funds and indirectly by Baker Bros. Advisors LP and Baker Bros. Advisors (GP), LLC. Mr. Baker expressly disclaims beneficial ownership over shares held directly by the Baker Brothers Funds and indirectly by Baker Bros. Advisors LP and Baker Bros. Advisors (GP), LLC, except to the extent of his pecuniary interest therein, if any, by virtue of his pecuniary interest therein. Dr. Neu, a member of our board of directors, is an employee of Baker Bros. Advisors LP. Under the terms of the warrants issued to the Baker Brothers Funds, the Baker Brothers Funds are not permitted to exercise such warrants to purchase common stock to the extent that such exercise would result in the Baker Brothers Funds (and their affiliates) beneficially owning more than 4.999% of the number of shares of our common stock issued and outstanding immediately after giving effect to the issuance of shares of common stock issuable upon exercise of such warrants to purchase common stock. This limitation on exercise of the warrants to purchase common stock issued to the Baker Brothers Funds is referred to in this footnote as the "Beneficial Ownership Cap." The Baker Brothers Funds have the right to increase this beneficial ownership limitation in their discretion on 61 days' prior written notice to us, provided that in no event are the Baker Brothers Funds permitted to exercise such warrants to purchase common stock to the extent that such exercise would result in the Baker Brothers Funds (and their affiliates) beneficially owning in the aggregate more than 19.99% of the number of shares of our common stock issued and outstanding or the combined voting power of our securities outstanding immediately after giving effect to the issuance of shares of common stock issuable upon exercise of such warrants to purchase common stock.

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- (4) Includes 2,012,500 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018.
- (5) Includes 3,903,191 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018.
- (6) Includes 1,376,206 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018.
- (7) Consists of shares reported under footnote 3 to this table above. Mr. Baker is a managing member of Baker Bros. Advisors LP and is a principal of Baker Bros. Advisors (GP), LLC, the sole general partner of Baker Bros. Advisors LP. Baker Bros. Advisors LP serves as the investment advisor to the Baker Brothers Funds. Accordingly, Mr. Baker may be deemed to have sole power to direct the voting and disposition of the shares of common stock held directly by the Baker Brothers Funds and indirectly by Baker Bros. Advisors LP and Baker Bros. Advisors (GP), LLC. Mr. Baker expressly disclaims beneficial ownership over shares held directly by the Baker Brothers Funds and indirectly by Baker Bros. Advisors LP and Baker Bros. Advisors (GP), LLC, except to the extent of his pecuniary interest therein, if any, by virtue of his pecuniary interest therein.
- (8) Consists of 649,374 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018.
- (9) Includes 693,001 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018.
- (10) Consists of 213,334 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018.
- (11) Includes 125,834 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018, and 7,000 shares of common stock held in the name Brian Macdonald for Maxine Gowen Trust, for which Dr. Gowen is a beneficiary and trustee.
- (12) Includes 432,811 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018.
- (13) Includes 213,334 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018.
- (14) Includes 273,334 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018.
- (15) Includes 187,499 shares of common stock subject to outstanding stock options that are exercisable within 60 days after April 30, 2018.
- (16) Includes 6,390,561 shares of common stock subject to outstanding stock options held by the directors and executive officers as a group that are exercisable within 60 days after April 30, 2018 and shares reported in clauses (i) through (iv) of the first sentence of footnote 3 to this table above.

EXECUTIVE COMPENSATION

Compensation Discussion and Analysis

This Compensation Discussion and Analysis, or CD&A, should be read in conjunction with the compensation tables and narratives that immediately follow this section.

Introduction

This CD&A provides an overview and analysis of the philosophy, objectives, process, components and additional aspects of our 2017 executive compensation program. This analysis focuses on the compensation paid to our named executive officers, or NEOs:

- Vincent J. Milano, President and Chief Executive Officer
- Louis J. Arcudi, III, Chief Financial Officer and Senior Vice President, Operations
- R. Clayton Fletcher, Senior Vice President of Business Development and Strategy
- Joanna Horobin, Senior Vice President and Chief Medical Officer
- Jonathan Yingling, Senior Vice President and Chief Scientific Officer
- Sudhir Agrawal, Former President of Research

Compensation Philosophy and Objectives

Our general executive compensation philosophy has been established by our compensation committee, which acts pursuant to authority delegated to it by our board of directors. Our compensation committee is comprised solely of independent directors as defined by applicable rules and regulations of Nasdaq and the SEC. The compensation committee seeks to achieve the following broad goals in connection with our executive compensation program:

- attract, retain and motivate the best possible executive talent;
- ensure executive compensation is aligned with our corporate strategies and business objectives, including our short-term operating goals and longer-term strategic objectives;
- promote the achievement of key strategic and financial performance measures by linking short- and long-term cash and equity incentives to the achievement of measurable corporate and individual performance goals; and
- align executives' incentives with the creation of stockholder value.

To achieve these objectives, the compensation committee:

- sets short- and long-term compensation at levels the compensation committee believes are competitive with those of other companies in our industry and our region that compete with us for executive talent;
- ties a substantial portion of each executive officer's overall cash compensation to key strategic, financial, research, and operational goals such as clinical trial and regulatory progress, intellectual property portfolio development, establishment and maintenance of key strategic relationships, and exploration of business development opportunities, as well as our financial and operational performance; and
- provides a portion of our executive compensation in the form of stock options that vest over time from the date of grant of the option awards and from the time of achievement of performance milestones when applicable, which we believe helps to retain our executives and

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align their interests with those of our stockholders by allowing them to participate in the longer term success of our company as reflected in stock price appreciation.

Advisory Vote on Executive Compensation

We conducted an advisory vote on executive compensation, commonly referred to as a "say on pay" proposal, at our 2017 annual meeting. While this vote was not binding on us, we value the opinions of our stockholders and, to the extent there is any significant vote against the compensation of our named executive officers in the future, we will consider our stockholders' concerns and our board of directors and compensation committee will evaluate whether any actions are necessary to address those concerns.

At our 2017 annual meeting, approximately 99% of the votes cast on the advisory vote on executive compensation approved the compensation paid to our named executive officers as disclosed in the proxy statement for that meeting. The board of directors and compensation committee considered the results of this advisory vote, together with the other factors and data, in determining executive compensation decisions and will continue to consider the outcome of our say on pay votes when making future compensation decisions for our named executive officers.

Also at our 2017 annual meeting, we conducted an advisory, non-binding vote on the frequency of voting on executive compensation in which approximately 97% of the votes cast approved the frequency of every "one year" for future executive compensation advisory votes. We plan to propose an advisory vote on the frequency of the executive compensation advisory vote at least once every six calendar years.

Executive Compensation Process

Role of Our Compensation Committee and Our Chief Executive Officer

In order to accomplish its objectives consistent with its philosophy for executive compensation and determine compensation for our named executive officers, our compensation committee reviews competitive information on executive compensation practices from peer companies as well as an assessment of overall corporate performance and individual performance. In connection therewith, our compensation committee typically takes the following actions annually:

- reviews chief executive officer performance;
- seeks input from our chief executive officer on the performance of all other executive officers;
- reviews all components of executive officer compensation, including base salary, cash bonus targets and awards, equity compensation, the dollar value to the executive and cost to us of all health and life insurance and other employee benefits, and the estimated payout obligations under severance and change in control scenarios;
- consults with its independent compensation consultant;
- holds executive sessions (without our management present);
- reviews information regarding the performance and executive compensation of other companies; and
- reviews the outcomes from the foregoing with the board of directors.

Our chief executive officer does not submit an assessment of his own performance, does not present a recommendation on his own compensation, and does not participate in the portion of the meeting where his compensation is determined. Our compensation committee determines and approves the compensation for our chief executive officer and other executive officers.

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Under our annual performance review program for our executive officers, annual performance goals are determined for our company as a whole and for each executive officer individually.

Annual corporate goals are proposed by management and approved by the board of directors. These corporate goals target the achievement of specific research, clinical, operational, and financial milestones. The compensation committee determines how the components of our annual corporate goals will contribute to the overall performance evaluation.

Annual individual goals focus on contributions that facilitate the achievement of our corporate goals. Individual goals are proposed at the start of each year by each executive and approved by the chief executive officer and, as appropriate, the compensation committee. Typically, the compensation committee sets the chief executive officer's goals and reviews and discusses with the chief executive officer the goals for all other executive officers. The individual performance goals of each named executive officer consist primarily of the key objectives and goals from our annual business plan that relate to the functional area for which the executive officer is responsible. The individual performance goals for the chief executive officer are largely coextensive with the corporate goals.

At the end of each year, the compensation committee evaluates corporate and individual performance.

- In assessing corporate performance, the compensation committee evaluates corporate performance alongside the approved corporate goals for the year and also evaluates other aspects of corporate performance, including achievements and progress made by us outside of the corporate goals.
- In assessing individual performance, the compensation committee evaluates corporate performance in the areas of each officer's responsibility and relies on the chief executive officer's evaluation of each other officer. The chief executive officer prepares evaluations of the other executives and in doing so compares individual performance to the individual performance goals. The chief executive officer recommends annual executive salary increases, annual stock option awards and bonuses, if any, for the other executives, which are then reviewed and approved by the compensation committee. In the case of the chief executive officer, the compensation committee conducts his individual performance evaluation.

During this process, the compensation committee consults with its independent compensation consultant. To that end, in connection with the compensation committee's annual performance and compensation review in the fourth quarter of 2016, Pearl Meyer & Partners, LLC, or Pearl Meyer, provided the compensation committee with a blend of the data from the 2016 peer group (identified below) and compensation survey data from the Radford 2016 Global Life Sciences Survey, a survey of U.S. biotech companies. We refer to this blended data as the "2016 market compensation data."

For all executives, annual base salary increases, if any, are awarded during the first quarter following the end of the fiscal year. Annual stock option awards and bonuses, if any, are granted as determined by the compensation committee and are typically granted in the first quarter of the fiscal year.

The compensation committee generally does not plan to approve annual equity grants to employees, including named executive officers, at a time when our company is in possession of material non-public information. We do not award stock options to named executive officers concurrently with the release of material non-public information.

Role of the Compensation Committee's Independent Consultant

In the fourth quarter of 2016, our compensation committee engaged Pearl Meyer in connection with our 2017 annual compensation assessment to review our executive compensation practices and to

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provide the compensation committee with an assessment of our compensation program against competitive market data. See "Use of Market Compensation Data" below for a discussion of the competitive market compensation data compiled by Pearl Meyer. Based on this assessment, Pearl Meyer made recommendations to our compensation committee regarding the amount and form of executive compensation, equity incentive programs, and compensation generally. Pearl Meyer did not provide any services to our company during 2016 or 2017 other than pursuant to their respective engagement by the compensation committee.

Our compensation committee analyzed whether the work of Pearl Meyer as a compensation consultant has raised any conflict of interest, taking into consideration the following factors: (a) the provision of other services to us by Pearl Meyer; (b) the amount of fees received from us by Pearl Meyer, as a percentage of the total revenue of Pearl Meyer; (c) Pearl Meyer's policies and procedures that are designed to prevent conflicts of interest; (d) any business or personal relationship of Pearl Meyer or the individual advisors employed by Pearl Meyer with a member of the compensation committee or any executive officer; and (e) any shares of our stock owned by Pearl Meyer or the individual advisors employed by Pearl Meyer. Our compensation committee determined, based on its analysis of the above factors, that the work of Pearl Meyer and the individual compensation advisors employed by Pearl Meyer as compensation consultants has not created any conflict of interest and the compensation committee is satisfied with the independence of Pearl Meyer. Going forward, the compensation committee intends to assess the independence of any of our compensation advisers by reference to the foregoing factors, consistent with applicable rules and regulations of Nasdaq and the SEC.

Use of Market Compensation Data

In making compensation decisions, our compensation committee reviewed competitive market compensation data compiled by Pearl Meyer. As part of its engagement, Pearl Meyer worked with the compensation committee in the fourth quarter of 2016 to select a peer group of publicly traded companies to be used in connection with our 2017 compensation decisions, including stock options granted during 2017, fiscal year 2017 salary adjustments and fiscal year 2017 target bonus percentages. In selecting this peer group, the compensation committee and Pearl Meyer generally targeted mid- to late-development stage companies in the Pharmaceuticals, Biotechnology and Life Sciences sectors that generally met the following screening criteria:

- Company Size: revenue less than or equal to \$150M; operating expense less than or equal to four times our operating expense (i.e., less than or equal to \$230M); employees between 20-200;
- Business Operations: conducting Phase 2 or Phase 3 clinical trials in at least one of oncology, rare diseases, or leveraging a 'technology platform' model; and
- Other: exclude subsidiaries; companies with business challenges; companies having market valuations below \$50M; and companies that have recently conducted an initial public offering.

The following table lists the companies included in the 2016 peer group used in connection with our 2017 compensation decisions referred to above:

| | | |
|-------------------------------|-------------------------------|-------------------------------|
| Argos Therapeutics, Inc. | Dicerna Pharmaceuticals, Inc. | Inovio Pharmaceuticals, Inc. |
| Aduro BioTech, Inc. | Dynavax Technologies Corp. | OncoMed Pharmaceuticals, Inc. |
| Advaxis, Inc. | Endocyte, Inc. | Regulus Therapeutics, Inc. |
| Arrowhead Research Corp. | GlycoMimetics, Inc. | WAVE Life Sciences, Inc. |
| Celldex Therapeutics, Inc. | Immune Design Corp. | Xencor, Inc. |
| Concert Pharmaceuticals, Inc. | Immunomedics, Inc. | |

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The foregoing peer group companies were recommended by Pearl Meyer and approved by our compensation committee because they have similar business profiles to ours taking into account number of employees, market value and stage of development. Additionally, while there were no changes to the screening criteria used for determining the 2016 peer group, as compared to the determination of the 2015 peer group, certain companies were excluded from or added to the 2016 peer group, primarily due to application of our screening criteria (e.g. quantitative metrics and market capitalization).

Our compensation committee intends that if we achieve our corporate goals and the executive performs at the level expected, the executive should have the opportunity to receive compensation that is competitive with industry norms. Accordingly, our compensation committee generally targets overall compensation for executives towards the 50th percentile of the market data. However, the compensation committee does not apply those targets formulaically and allows for individuals to be positioned at different percentiles based on experience, performance levels and potential performance levels of the executive, and changes in duties and responsibilities.

Components of Executive Compensation

The primary elements of our executive compensation program are:

- base salary;
- annual cash bonuses;
- stock option awards;
- health insurance, life insurance, and other employee benefits; and
- severance and change in control benefits.

The value of our variable, performance-based compensation is allocated between short-term compensation in the form of a cash bonus and long-term compensation in the form of stock option awards that vest over time from the date of grant of the option awards or from the time of achievement of performance milestones. The annual cash bonus is intended to provide an incentive to our executives to achieve short-term operational objectives. The stock option award is intended to provide an incentive for our executives to achieve longer-term strategic business goals, which should lead to higher stock prices and increased stockholder value. We have not had any formal or informal policy or target for allocating compensation between long-term and short-term compensation, between cash and non-cash compensation, or among the different forms of non-cash compensation. Instead, the compensation committee, after reviewing industry information and our cash resources, determines subjectively what it believes to be the appropriate level and mix of the various compensation components.

We do not have any defined benefit pension plans or any non-qualified deferred compensation plans.

We are party to employment agreements and employment offer letters with each of our named executive officers. Employment agreements and employment offer letters with our named executive officers are described below under the caption "Employment and Separation Agreements with our Named Executive Officers."

Base Salary

In establishing base salaries for our named executive officers, our compensation committee typically reviews the market compensation data presented by the committee's independent compensation consultant, considers historic salary levels of the executive officer and the nature of the

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executive officer's responsibilities, compares the executive officer's base salary with those of our other executives, and considers the executive officer's experience, performance and contributions. The compensation committee also typically considers the challenges involved in hiring and retaining executive talent in our industry and region. In assessing the executive officer's performance, the compensation committee considers the executive officer's role in the achievement of the annual corporate goals, as well as, in the case of our executive officers other than our chief executive officer, the performance evaluation prepared by our chief executive officer with respect to such executive officer. The compensation committee considers such evaluation as a means of informing the compensation committee's decision as to whether the executive officer's performance was generally consistent with our expectations.

As part of our 2016 annual performance and compensation review, the compensation committee approved annual base salaries for our executive officers for 2017. In setting these annual base salaries, the compensation committee reviewed the 2016 market compensation data presented by Pearl Meyer. Similarly, as part of our December 2017 annual performance and compensation review, the compensation committee reviewed the 2017 market compensation data and approved new annual base salaries for our executive officers for 2018. In each of the 2016 and 2017 reviews, after considering each executive's current salary, performance, and experience in the context of the market compensation data as well as relative to one another, the compensation committee approved the following salary increases and resulting base salaries:

| Executive | 2016 | 2017 | % Increase | 2018 | % Increase |
|-----------------|-------------|-------------|------------|-------------|------------|
| | Base Salary | Base Salary | | Base Salary | |
| Mr. Milano | \$ 600,000 | \$ 600,000 | 0.0 | \$ 600,000 | 0.0 |
| Mr. Arcudi | \$ 347,500 | \$ 357,900 | 3.0 | \$ 370,000 | 3.4 |
| Mr. Fletcher | \$ 375,000 | \$ 386,300 | 3.0 | \$ 400,000 | 3.5 |
| Dr. Horobin | \$ 390,000 | \$ 410,000 | 5.1 | \$ 425,000 | 3.7 |
| Dr. Yingling(1) | — | \$ 385,000 | — | \$ 400,000 | 3.9 |
| Dr. Agrawal(2) | \$ 588,100 | \$ 588,100 | 0.0 | — | — |

- (1) Dr. Yingling commenced employment with us in February 2017.
- (2) Effective May 31, 2017, Dr. Agrawal resigned as our President of Research and as a member of our board of directors.

Annual Cash Performance Bonuses

The compensation committee generally structures cash bonuses by linking them to the achievement of the annual corporate goals, corporate performance outside of the corporate goals (i.e. an unexpected opportunistic business development deal would be factored subjectively as an adjustment to the score that the committee derived from evaluation of the corporate goals), and individual performance. The amount of the bonus paid, if any, varies among the executive officers depending on individual performance and their contribution to the achievement of our annual corporate goals and corporate performance generally. The compensation committee reviews and assesses corporate goals and individual performance by executive officers and considers the reasons why specific goals have been achieved or have not been achieved. While achievement against the applicable corporate goals is given substantial weight in connection with the determination of annual bonuses, we also factor in an evaluation of our named executive officers' individual performance based on analysis of achievement of individual performance goals as well as the following subjective criteria:

- leadership;
- management;
- judgment and decision-making skills;

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- results orientation; and
- communication.

The compensation committee sets the individual bonus target percentages for each of our named executive officers. In determining the target bonus percentages to be used for 2017, the compensation committee concluded that the target bonus percentages should be competitive with the 50th percentile of the 2016 market compensation data and that there be no difference in the target bonus percentages of our named executive officers, other than Mr. Milano and Dr. Agrawal. The following table sets forth the individual bonus target percentages for each of our named executive officers for 2017 and 2018.

| Executive | Target Cash Bonus (% of Base Salary) | |
|--------------|--------------------------------------|------|
| | 2017 | 2018 |
| Mr. Milano | 50% | 50% |
| Mr. Arcudi | 40% | 40% |
| Mr. Fletcher | 40% | 40% |
| Dr. Horobin | 40% | 40% |
| Dr. Yingling | 40% | 40% |
| Dr. Agrawal | 50% | — |

Consistent with our company-wide annual incentive plan applicable to all employees, including our named executive officers, both a corporate performance score and individual performance score factored into the determination of each executive officer's cash bonus award for 2017.

Under the terms of our incentive plan, the corporate performance score is based on the degree to which corporate performance objectives have been achieved. This score is determined by the compensation committee and may range from 0-125%. The individual performance score is based on:

- the degree to which individual performance objectives have been achieved;
- the competencies and behaviors demonstrated in achieving results;
- the technical skills required by the position; and
- the completion of the ongoing responsibilities required by the position.

The individual performance score may range from 0-125% and is approved by the compensation committee. The individual's actual award is then calculated as follows:



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In setting corporate goals in the first quarter of 2017, the committee agreed to group the business objectives into one of three primary categories, each of which would contribute toward the overall assessment of our corporate performance. In assessing our corporate performance against our 2017 corporate goals, and determining the corporate performance score, the compensation committee considered the extent to which the company achieved the business objectives in each of the categories, and assigned a score for each category, as summarized in the following table:

| <u>Primary Goals</u> | <u>Contribution toward Corporate Performance Score</u> | <u>Committee's Assessment of Performance (out of 100%)</u> | <u>Highlights of Performance on Key Objectives</u> |
|--|--|--|--|
| Advance IMO-2125 program toward Phase 3 and beyond PD-1 refractory melanoma | 55% | 50% | <ul style="list-style-type: none"> • Completed Phase 1/2 enrollment and related study goals with positive momentum as the trial progresses into 2018. • Readiness on schedule for planned Q1-2018 initiation of a Phase 3 trial. Progress in expanding program beyond anti-PD1 refractory melanoma vis a vis initiation of single-agent study, business case analyses, and pre-clinical assessments of other novel combinations. |
| Advance 3GA program through IND-enabling activities | 15% | 15% | <ul style="list-style-type: none"> • Completed IND-enabling activities for lead discovery compound. • Significantly increased objective knowledge and understanding of 3GA mechanism of action. |
| Advance IMO-8400 program toward next decision point | 10% | 7% | <ul style="list-style-type: none"> • Completed enrollment of IMO-8400 Phase 2 trial, although with longer timelines than planned. |
| Enhance our ability to be successful through relevant foundational objectives | 20% | 18% | <ul style="list-style-type: none"> • Achieved target of 18 months cash on hand at year-end, in part as a result of financing though also partially enabled by delaying planned programs. • Reviewed strategic business development options including recommendations to board of directors on opportunities to explore/pursue. • Continued to advance company values and desired culture. |

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Based on these achievements and resulting category scores, the compensation committee determined to use a corporate performance score of 90% for the 2017 bonus calculation.

In assessing each named executive officer's individual performance score, the compensation committee determined:

- Mr. Milano's overall score would be equivalent to the corporate performance score of 90%;
- Mr. Arcudi's individual performance score, recognizing his achievement against his personal objectives, including his contributions to the completion of our 2017 offering and general leadership contributions, would be 95%, resulting in an overall bonus equal to 86% of his bonus target;
- Mr. Fletcher's individual performance score, recognizing his achievement against his personal objectives, including his role in business development along with his general leadership contributions, would be 105%, resulting in an overall bonus equal to 95% of his bonus target;
- Dr. Horobin's individual performance score, recognizing her achievement against her personal objectives, including her role in achievements against our IMO-2125 and IMO-8400 clinical program goals along with her general leadership contributions, would be 90%, resulting in an overall bonus equal to 81% of her bonus target; and
- Dr. Yingling's individual performance score, recognizing his achievement against his personal objectives, including his role in advancing objective knowledge and understanding of our discovery platform along with his general leadership contributions, would be 115%, resulting in an overall bonus equal to 103% of his bonus target.

Dr. Agrawal resigned from the Company prior to the compensation committee's determinations and in connection with his severance agreement, received a prorated bonus for 2017 at 100% of target.

Equity Compensation

Our equity award program is the primary vehicle for offering long-term incentives to our executive officers, including our named executive officers. We believe that equity awards provide our executives with a strong link to our long-term performance, create an ownership culture and help to align the interests of our named executive officers and our stockholders. Equity grants are intended as both a reward for contributing to the long-term success of our company and an incentive for future performance. The vesting feature of our equity awards is intended to further our goal of executive retention by providing an incentive to our named executive officers to remain in our employ during the vesting period. In determining the size of equity awards to our executives, our compensation committee considers:

- the achievement of our annual corporate goals;
- individual performance;
- the applicable executive officer's previous awards, including the exercise price of such previous awards;
- the recommendations of management;
- the market compensation data presented by the committee's independent compensation consultant, and
- the combined components of the executive officer's compensation.

The compensation committee approves all equity awards to our executive officers. Our equity awards have typically taken the form of stock options. However, under the terms of our stock incentive plans, we may grant equity awards other than stock options, such as restricted stock awards, stock appreciation rights, and restricted stock units.

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The compensation committee typically makes initial stock option awards to named executive officers upon commencement of their employment and annual stock option awards thereafter. Stock option awards to our named executive officers after the initial stock option awards are typically granted annually after the annual performance review. For 2017, this review occurred at the regularly scheduled meeting of the compensation committee held in the first quarter of 2017. In general, annual stock option grants vest with respect to 25% of the shares subject to the option on the first anniversary of the date of grant and with respect to the balance of the shares subject to the option in 12 equal quarterly installments over the three-year period thereafter. The exercise price of stock options equals the fair market value of our common stock on the date of grant, which is typically equal to the closing price of our common stock on the Nasdaq Capital Market on the date of compensation committee approval except in the case of new-hire grants, which are approved in advance by the compensation committee with the grant occurring at an exercise price established at the closing price of our common stock on the first day of employment.

In December 2016, as part of its annual executive compensation and performance review, the compensation committee reviewed the 2016 market compensation data regarding annual stock option grants. The committee granted our named executive officers options to purchase shares of our common stock in January 2017 as follows:

| <u>Executive</u> | <u>2017 Option Award (# options)</u> |
|------------------|--|
| Mr. Milano | 300,000 |
| Mr. Arcudi | 185,000 |
| Mr. Fletcher | 185,000 |
| Dr. Horobin | 185,000 |
| Dr. Yingling(1) | 600,000 |
| Dr. Agrawal | 185,000 |

- (1) In connection with the hiring of Dr. Yingling and in addition to the option granted to Dr. Yingling to purchase 325,000 shares of our common stock upon commencement employment, our board of directors approved the grant to Dr. Yingling of a stock option to purchase 275,000 shares of our common stock. The option was granted as an inducement equity award outside of our 2013 Stock Incentive Plan and was made as an inducement material to Dr. Yingling's acceptance of employment with us.

Benefits and Other Compensation

We maintain broad-based benefits that are provided to all employees, including health and dental insurance, life and disability insurance, and a 401(k) plan. During 2017, consistent with our prior practice, we matched 50% of the employee contributions to our 401(k) plan up to a maximum of 6% of the participating employee's annual salary, resulting in a maximum company match of 3% of the participating employee's annual salary, and subject to certain additional statutory dollar limitations. Named executive officers are eligible to participate in all of our employee benefit plans, in each case on the same basis as other employees and subject to any limitations in such plans. Each of our named executive officers except for Mr. Fletcher contributed to our 401(k) plan and their contributions were matched by us.

Our board of directors has adopted a retirement policy to address the treatment of options in the event of an employee's retirement that applies to all employees, including all officers. For purposes of this policy, an employee will be deemed to have retired if the employee terminates his or her

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employment with us, has been an employee of ours for more than 10 years and is older than 65 upon termination of employment. Under the policy, if an employee retires, then:

- all outstanding options held by the employee will automatically vest in full; and
- the period during which the employee may exercise the options will be extended to the expiration of the term of the option under the applicable option agreement.

Our board of directors adopted this policy for our employees in recognition of the importance of stock options to the compensation of employees and in order to provide each of our employees with the opportunity to get the full benefit of the options held by the employee in the event of his or her retirement after making 10 years of contributions to our company.

We occasionally pay relocation expenses for newly-hired executive officers who we require to relocate as a condition to their employment by us. We also occasionally pay local housing expenses and travel costs for executives who maintain a primary residence outside of a reasonable daily commuting range to our headquarters. We believe that these are typical benefits offered by comparable companies to executives who are asked to relocate and that we would be at a competitive disadvantage in trying to attract executives who would need to relocate in order to work for us if we did not offer such assistance. We did not provide any relocation benefits to any of our executives in 2017.

Our named executive officers may also participate in our employee stock purchase plan, which is generally available to all employees who work over 20 hours per week, so long as they own less than 5% of our common stock, including for this purpose vested and unvested stock options. Mr. Arcudi participated in the employee stock purchase plan in 2017.

Severance and Change in Control Benefits

Under our employment agreements and employment offer letters with our named executive officers, we have agreed to provide severance and other benefits in the event of the termination of their employment under specified circumstances. On March 7, 2017, the board of directors approved a form of Severance and Change of Control Agreement to be entered into between the Company and our named executive officers. The severance benefits contained in the Change of Control Agreements supersede the severance and change of control terms contained in the existing employment agreements and employment offer letters. We have provided more detailed information about these benefits, along with estimates of their value under various circumstances, under the captions "Employment and Separation Agreements with our Named Executive Officers" and "Potential Payments Upon Termination or Change in Control" below.

We believe providing severance and/or change in control benefits as a component of our compensation structure can help us compete for executive talent and attract and retain highly talented executive officers whose contributions are critical to our long-term success. After reviewing the practices of companies in general industry surveys published by Radford Survey + Consulting, and consultation with Pearl Meyer, we believe that our severance and change in control benefits are appropriate.

Tax Deductibility of Executive Compensation

Prior to December 22, 2017, when the Tax Cuts and Jobs Act, or the TCJA, was signed into law, Section 162(m) of the Internal Revenue Code of 1986, as amended, which we refer to as the Code, generally disallowed a tax deduction to publicly held companies for compensation paid to the chief executive officer and the three other most highly compensated executives (other than the chief financial officer) in excess of \$1 million per officer in any year that such compensation did not qualify as performance-based. In connection with fiscal 2017 compensation decisions, the compensation committee considered the potential tax deductibility of executive compensation under Section 162(m) of

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the Code and sought to qualify certain elements of these applicable executives' compensation as performance-based while also delivering competitive levels and forms of compensation.

Under the TCJA, the performance-based exception has been repealed and the \$1 million deduction limit now applies to anyone serving as the chief executive officer or the chief financial officer at any time during the taxable year and the top three other highest compensated executive officers serving at fiscal year end. In addition, once an individual becomes a covered employee under Section 162(m) for any taxable year beginning after December 31, 2016, this status carries forward to all future years, even in the event of the employee's termination or death. The new rules generally apply to taxable years beginning after December 31, 2017, but do not apply to remuneration provided pursuant to a written binding contract in effect on November 2, 2017 that is not modified in any material respect after that date.

The compensation committee reserves the right to use its judgment to authorize compensation payments that may be subject to the limit when the compensation committee believes such payments are appropriate and in the best interests of our company and our stockholders. There can be no assurance that compensation awarded to our executive officers will be treated as qualified performance-based compensation under Section 162(m).

Employment and Separation Agreements with our Named Executive Officers

We have entered into agreements with our named executive officers, as discussed below, that provide benefits to the executives upon their termination of employment in certain circumstances or under which we have agreed to specific compensation elements. Our named executive officers are at-will employees.

Employment Agreements and Offer Letters

Vincent J. Milano

We are a party to an employment offer letter with Mr. Milano, our President and Chief Executive Officer. Under the employment offer letter, Mr. Milano is entitled to receive an annual base salary of \$600,000 or such higher amount as our compensation committee or our board of directors may determine. In addition, under the employment offer letter, Mr. Milano is eligible to receive an annual bonus of up to 50% of his base salary, subject to adjustment, based on the achievement of both individual and company performance objectives as developed and determined by our board of directors.

Under the employment offer letter, if we terminate Mr. Milano's employment without cause, prior to a change-in-control, as such terms are defined in the agreement, he will be entitled to severance payments for 24 months equivalent to his then-current base salary, payable in accordance with our then-current payroll practices, and benefits continuation for the shorter of 24 months or the date his COBRA continuation coverage expires and to receive any bonus that he earned and that our board of directors approved prior to the termination to the extent not then paid. If we terminate Mr. Milano's employment without cause or Mr. Milano terminates his employment with us for good reason, as such terms are defined in the agreement, upon or within one year after a change in control, he will be entitled to severance payments for 24 months equivalent to his then-current base salary, payable in accordance with our then-current payroll practices, and benefits continuation for the shorter of 24 months or the date his COBRA continuation coverage expires and to receive any bonus that he earned and that our board of directors approved prior to the termination to the extent not then paid and the inducement option award that he received upon his commencement of employment with us will vest in full and become immediately exercisable.

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Our agreement to pay severance and benefits pursuant to the employment offer letter is subject to Mr. Milano entering into a separation and release agreement and is superseded by his severance and change in control agreement described below to the extent then in effect.

Louis J. Arcudi, III

We are a party to an employment letter, as amended, with Mr. Arcudi, our Senior Vice President of Operations, Chief Financial Officer, Treasurer and Assistant Secretary. Under the employment letter, Mr. Arcudi was initially entitled to receive an annual base salary of \$315,000, which amount is subject to adjustment from time to time in accordance with normal business practices. In addition, under the employment letter, Mr. Arcudi is entitled to receive an annual bonus in an amount approved by our board of directors or the compensation committee based on the achievement of both individual and company performance objectives as developed and determined by our board of directors.

Under the employment letter, if we terminate Mr. Arcudi's employment without cause at any time, or if he terminates his employment for good reason upon a change in control or within one year after a change of control, as such terms are defined in the agreement, we have agreed to:

- continue to pay Mr. Arcudi his base salary as severance for 12 months following such termination payable in accordance with our then current payroll practices; and
- continue to provide Mr. Arcudi with health and dental benefits for 12 months following such termination, except to the extent another employer provides Mr. Arcudi with comparable benefits.

Our agreement to pay severance and benefits pursuant to the employment letter is subject to Mr. Arcudi entering into a separation and release agreement and is superseded by his severance and change in control agreement described below to the extent then in effect.

R. Clayton Fletcher

We are a party to an employment letter with Mr. Fletcher, our Senior Vice President of Business Development and Strategic Planning. Under the terms of the employment letter, Mr. Fletcher is entitled to receive an annual base salary of \$360,000 or such higher amount as our compensation committee or our board of directors may determine. In addition, under the employment letter, Mr. Fletcher is eligible to receive an annual bonus of up to 35% of his base salary, subject to adjustment, based on the achievement of both individual and company performance objectives as established by our board of directors. Under the employment letter, if we terminate Mr. Fletcher's employment without cause at any time, or if he terminates his employment for good reason upon a change in control or within one year after a change in control, as such terms are defined in the agreement, we have agreed to:

- continue to pay Mr. Fletcher his base salary as severance for 12 months following such termination payable in accordance with our then current payroll practices plus any bonus earned and approved by the board of directors but unpaid at the time of termination;
- continue to provide Mr. Fletcher with health and dental benefits for 12 months following such termination, except to the extent another employer provides Mr. Fletcher with comparable benefits; and
- only in the event of a termination described above that occurs upon or within one year after a change in control, fully vest all options granted to Mr. Fletcher upon the commencement of his employment.

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Our agreement to pay severance and benefits pursuant to the employment offer letter is subject to Mr. Fletcher entering into a separation and release agreement and is superseded by his severance and change in control agreement described below to the extent then in effect.

Joanna Horobin, M.B., Ch.B

We are a party to an employment letter with Dr. Horobin, our Chief Medical Officer. Under the terms of the employment letter, Dr. Horobin is entitled to receive an annual base salary of \$390,000 or such higher amount as our compensation committee or our board of directors may determine. In addition, under the employment letter, Dr. Horobin is eligible to receive an annual bonus of up to 40% of her base salary, subject to adjustment, based on the achievement of both individual and company performance objectives as established by our board of directors. Under the employment letter, if we terminate Dr. Horobin's employment without cause at any time, or if she terminates her employment for good reason upon a change in control or within one year after a change in control, as such terms are defined in the agreement, we have agreed to:

- continue to pay Dr. Horobin her base salary as severance for 12 months following such termination payable in accordance with our then current payroll practices plus any bonus earned and approved by the board of directors but unpaid at the time of termination;
- continue to provide Dr. Horobin with health and dental benefits for 12 months following such termination, except to the extent another employer provides Dr. Horobin with comparable benefits; and
- only in the event of a termination described above that occurs upon or within one year after a change in control, fully vest all options granted to Dr. Horobin upon the commencement of her employment.

Our agreement to pay severance and benefits pursuant to the employment offer letter is subject to Dr. Horobin entering into a separation and release agreement and is superseded by her severance and change in control agreement described below to the extent then in effect.

Jonathan Yingling, Ph.D.

We are a party to an employment letter with Dr. Yingling, our prior Senior Vice President of Early Development and, effective January 1, 2018, our current Chief Scientific Officer. Under the terms of the employment letter, Dr. Yingling is entitled to receive an annual base salary of \$385,000 or such higher amount as our compensation committee or our board of directors may determine. In addition, under the employment letter, Mr. Fletcher is eligible to receive an annual bonus of up to 40% of his base salary, subject to adjustment, based on the achievement of both individual and company performance objectives as established by our board of directors. Under the employment letter, if we terminate Dr. Yingling's employment without cause at any time, or if he terminates his employment for good reason upon a change in control or within one year after a change in control, as such terms are defined in the agreement, we have agreed to:

- continue to pay Dr. Yingling his base salary as severance for 12 months following such termination payable in accordance with our then current payroll practices plus any bonus earned and approved by the board of directors but unpaid at the time of termination;
- continue to provide Dr. Yingling with health and dental benefits for 12 months following such termination, except to the extent another employer provides Dr. Yingling with comparable benefits; and

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- only in the event of a termination described above that occurs upon or within one year after a change in control, fully vest all options granted to Dr. Yingling upon the commencement of his employment.

Our agreement to pay severance and benefits pursuant to the employment offer letter is subject to Dr. Yingling entering into a separation and release agreement and is superseded by his severance and change in control agreement described below to the extent then in effect.

Sudhir Agrawal, D. Phil.

Prior to his resignation on May 31, 2017, the terms of Dr. Agrawal's employment as our President of Research were set forth in an employment agreement, as amended, with Dr. Agrawal. The agreement had an initial three-year term that was automatically extended for an additional year unless either party provided prior written notice to the other that the term of the agreement was not to be extended. As a result, on each renewal date, the term of the agreement, as extended, was three years. On October 19, 2016, the term was extended from October 19, 2018 to October 19, 2019.

Under the agreement, Dr. Agrawal was entitled to receive an annual base salary of \$588,100 or such higher amount as determined by our compensation committee or our board of directors. In addition, under the agreement, as modified in December 2014, Dr. Agrawal was eligible to receive an annual bonus in an amount equal to 50% of his base salary, as determined by the compensation committee or our board of directors.

Pursuant to his employment agreement, if Dr. Agrawal's employment was terminated by us without cause or terminated by Dr. Agrawal for good reason, as such terms are defined in the agreement, we agreed to:

- continue to pay Dr. Agrawal his base salary as severance for a period ending on the earlier of the final day of the term of the agreement in effect immediately prior to such termination and the second anniversary of his termination date;
- pay Dr. Agrawal a lump sum cash payment equal to the pro rata portion of the annual bonus that he earned in the year preceding the year in which his termination occurs;
- continue to provide Dr. Agrawal with healthcare, disability and life insurance benefits for a period ending on the earlier of the final day of the term of the agreement in effect immediately prior to the termination date and the second anniversary of the termination date, except to the extent another employer provides Dr. Agrawal with comparable benefits;
- accelerate the vesting of any stock options or other equity incentive awards previously granted to Dr. Agrawal as of the termination date to the extent such options or equity incentive awards would have vested had he continued to be an employee until the final day of the term of the agreement in effect immediately prior to such termination; and
- permit Dr. Agrawal to exercise any vested stock options until the second anniversary of the termination date.

If Dr. Agrawal's employment was terminated by him for good reason or by us without cause in connection with, or within one year after, a change in control, as such terms are defined in the agreement, we agreed to provide Dr. Agrawal with all of the items listed above, except that in lieu of the severance amount described above, we agreed to pay Dr. Agrawal a lump sum cash payment equal to his base salary multiplied by the lesser of the aggregate number of years or portion thereof remaining in his employment term and two years. We also agreed that if we executed an agreement that provides for our company to be acquired or liquidated, or otherwise upon a change in control, all unvested stock options held by Dr. Agrawal would vest in full.

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Our employment agreement with Dr. Agrawal provides that if all or a portion of the payments made under the agreement are subject to the excise tax imposed by Section 4999 of the Code, or a similar state tax or assessment, we will pay him an amount necessary to place him in the same after-tax position as he would have been had no excise tax or assessment been imposed. Any amounts paid pursuant to the preceding sentence will also be increased to the extent necessary to pay income and excise tax on those additional amounts.

In the event of Dr. Agrawal's death or the termination of his employment due to disability, we agreed to pay Dr. Agrawal or his beneficiary a lump sum cash payment equal to the pro rata portion of the annual bonus that he earned in the year preceding his death or termination due to disability. Additionally, any stock options or other equity incentive awards previously granted to Dr. Agrawal and held by him on the date of his death or termination due to disability would vest as of such date to the extent such options or equity incentive awards would have vested had he continued to be an employee until the final day of the term of the employment agreement in effect immediately prior to his death or termination due to disability. Dr. Agrawal or his beneficiary would have been permitted to exercise such stock options until the second anniversary of his death or termination of employment due to disability.

Dr. Agrawal agreed that during his employment with us and for a one-year period thereafter, he will not hire or attempt to hire any of our employees or compete with us.

In connection with his transition to his new role of President of Research in December 2014, we and Dr. Agrawal agreed that his employment would continue to be subject to and on the terms and conditions set forth in his employment agreement but for the change in position and the modification of Dr. Agrawal's target bonus to be a fixed at 50% of base salary rather than the 20% to 70% of base salary range set forth in the employment agreement. In addition, Dr. Agrawal acknowledged and agreed that, notwithstanding anything to the contrary set forth in his employment agreement, the transition of his employment from President and Chief Executive Officer to President of Research, and the changes in his authority, duties, responsibilities and reporting structure associated with such event, would not constitute good reason, as defined in the employment agreement, and that he would not and could not terminate his employment for good reason on the basis of such event and changes.

In consideration of the foregoing agreements, we agreed that the vesting of any and all stock options then held by Dr. Agrawal would be accelerated such that, as of that date, such options would be deemed vested to the extent such options would have been vested had Dr. Agrawal continued to be employed by us on October 19, 2017, and any portion of such options that remained unvested after giving effect to such acceleration would continue to vest in accordance with their respective terms. This acceleration did not apply to the options granted to Dr. Agrawal in December 2014 or January 2016.

On April 18, 2017, we entered into a separation agreement and release of claims with Dr. Agrawal, under which Dr. Agrawal agreed to resign as our President of Research and as a member of our board of directors, effective May 31, 2017. Pursuant to the agreement, we provided Dr. Agrawal the following separation benefits in exchange for him agreeing to a release of claims and complying with certain other continuing obligations contained therein (including compliance with the restrictive covenants in his employment agreement):

- We paid Dr. Agrawal a pro-rated 2017 bonus payment of \$121,648, less all applicable taxes and withholdings;
- We paid \$8,000, on behalf of Dr. Agrawal, for legal fees associated with the review, negotiation and execution of his separation agreement;
- We have agreed that, commencing on the first regular payroll date following his separation date until May 31, 2019, we will provide Dr. Agrawal with severance pay in the form of salary

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continuation payments at his annualized base salary rate in effect on the date of the separation agreement (\$588,100), payable in installments in accordance with our regular payroll practices;

- Dr. Agrawal is eligible to receive health and dental benefits through reimbursement of COBRA premiums from his separation date through no later than May 31, 2019;
- Dr. Agrawal is eligible to receive life and/or disability insurance benefits through reimbursement of costs of obtaining life and/or disability insurance substantially comparable to such benefits as were being provided immediately prior to his separation, until the earlier of May 31, 2019 and the date on which Dr. Agrawal becomes eligible through other employment for disability and/or life insurance; and
- Any stock options or other equity incentive awards previously granted to Dr. Agrawal and held by Dr. Agrawal on his separation date will, to the extent not already vested, continue to vest to the extent such options or equity incentive awards, as applicable, would have vested had Dr. Agrawal continued to be an employee through October 19, 2019, and Dr. Agrawal will be entitled to exercise any such options until the earlier of the expiration of such option and October 19, 2022.

In addition, we (a) paid all of Dr. Agrawal's compensation due and owed to him as of May 31, 2017 in accordance with our usual compensation and payroll practices, and (b) reimbursed Dr. Agrawal for all reasonable unreimbursed business expenses incurred by him as of May 31, 2017 in accordance with our expense reimbursement policy.

Dr. Agrawal also entered into a Scientific Advisor Agreement with us, effective June 1, 2017, under which Dr. Agrawal agreed to provide consulting services to us, and we have agreed to pay Dr. Agrawal consulting fees equal to \$10,000 per month for a term of six months.

Severance and Change in Control Agreements

We have entered into a Severance and Change of Control Agreement with each of Messrs. Milano, Arcudi and Fletcher, and Drs. Yingling and Horobin.

The Severance and Change of Control Agreements provide that if we consummate a change of control (as defined in the Severance and Change of Control Agreements), we will employ the executive for a period of 24 months from the date of the consummation of the change of control. Pursuant to the Severance and Change of Control Agreements, during such period:

- (i) the executive's position and duties for the company will be commensurate with the most significant of the duties and positions held by the executive during the 90 day period preceding the date of the consummation of the change of control;
- (ii) the executive's annual base salary will equal at least 12 times the highest monthly base salary paid to the executive during the 12 months prior to the date of the change of control;
- (iii) the executive will be entitled to an annual bonus equal to at least the greatest of (a) the average bonus paid to the executive in respect of the three years immediately preceding the year in which the change of control occurs, (b) the annual bonus paid for the year immediately preceding the year in which the change of control occurs and (c) 100% of the target bonus for (1) the year immediately preceding the year in which the change of control occurs, (2) the year in which the change of control occurs or (3) any year following the year in which the change of control occurs and prior to the then-current year, whichever is highest; and
- (iv) the executive will be entitled to certain other benefits as are consistent with the benefits paid to the executive during the year prior to the change of control.

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The Severance and Change of Control Agreements also provide that if an executive is terminated without "cause" or resigns for "good reason" (as such terms are defined in the Severance and Change of Control Agreements) in either case, within 24 months following a change of control, subject to the executive's timely execution and non-revocation of a general release of claims in a form provided by us and the executive's continued compliance with the invention, non-disclosure and non-competition agreement previously entered into in connection with the commencement of executive's employment, executives would receive a lump sum cash payment payable within 30 days after the date of termination equal to:

- (i) the executive's target bonus for the year of termination prorated for the portion of the year worked;
- (ii) 150% of the sum of (a) such executive's annual base salary for the year immediately preceding the year of termination and (b) the greatest of (1) the average bonus paid or earned and accrued, but unpaid to the executive in respect of the three years immediately preceding the year of termination, (2) the annual bonus paid for the year immediately preceding the year of termination and (3) the target bonus for the year of termination; and
- (iii) 150% of the Company's share of the annual premium for group medical and/or dental insurance coverage that was in place for the executive immediately prior to the date of termination.

In addition, all unvested options, restricted stock or stock appreciation rights held by the executive as of the date of termination will be immediately and automatically vested and/or exercisable in full as of the date of termination, and the executive will have the right to exercise any such options or stock appreciation rights for the longer of (A) the period of time provided for in the applicable equity award agreement or plan, or (B) the shorter of one year after the date of termination or the remaining term of the applicable equity award. However, under the terms of the Merger Agreement the post-termination exercise period of all outstanding stock options will continue in the event of the executive's termination of employment within 24 months following the effective time of the Mergers (other than for cause or due to the executive's resignation without good reason), until the three-year anniversary of such executive's termination, but in no event past the remaining term of the applicable equity award.

If the executive is terminated without "cause" or resigns for "good reason," prior to the date of a change of control, such executive will be entitled to the following under the Severance and Change of Control Agreement, subject to the executive's timely execution and non-revocation of a general release of claims in a form provided by us and the executive's continued compliance with the invention, non-disclosure and non-competition agreement previously entered into in connection with the commencement of executive's employment:

- (i) a lump sum cash payment payable within 30 days after the date of termination in an amount equal to the greater of (x) the average bonus paid or earned and accrued, but unpaid to the executive in respect of the three years immediately preceding the year of termination, and (y) the annual bonus paid for the year immediately preceding the year of termination prorated for the portion of the year worked;
- (ii) continued payment of the executive's base salary payable in accordance with our standard payroll practices over the one-year period following termination; and
- (iii) if the executive elects to continue receiving group medical and/or dental insurance under COBRA (to the extent the executive previously participated in such group insurance plans immediately prior to the date of termination), payment by us of our share of the premium for such coverage that we pay for active and similarly-situated employees who receive the same type of coverage for the one-year period following termination.

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The Severance and Change of Control Agreements expire on December 31, 2018, but on each anniversary thereof, unless notice of termination has been provided by a party, the term of such agreements will automatically be extended by one year.

Indemnification Agreements

On March 7, 2017, the board of directors approved a form of Indemnification Agreement to be entered into between the Company and our directors and officers. Each of Messrs. Milano, Arcudi, and Fletcher, and Drs. Horobin and Yingling entered into an Indemnification agreement with the Company. In general, the Indemnification Agreements provide that the Company will indemnify the director or officer to the fullest extent permitted by law for claims arising in his or her capacity as a director or officer of the Company or in connection with their service at our request for another corporation or entity. The Indemnification Agreements also provide for procedures that will apply in the event that a director or officer makes a claim for indemnification and establish certain presumptions that are favorable to the director or officer.

Formal Clawback Policy

In April 2015, ahead of any such requirement in the Dodd-Frank Wall Street Reform and Consumer Protection Act, our compensation committee adopted a formal clawback policy, which will apply in the event we are required to prepare an accounting restatement after the adoption of the clawback policy due to any material noncompliance with any financial reporting requirement under the U.S. federal securities laws. This policy requires us to use reasonable efforts to recover from any of our current or former executive officers who receive incentive-based compensation (including stock options awarded as compensation) during the three-year period preceding the date on which we are required to prepare an accounting restatement based on erroneous data, the excess of what would have been paid to such executive officer under the accounting restatement.

Summary Compensation Table

The table below summarizes compensation paid to or earned by our named executive officers for 2017, 2016 and 2015.

Summary Compensation Table for Fiscal Year 2017

| <u>Name and Principal Position</u> | <u>Year</u> | <u>Salary (\$)</u> | <u>Bonus (\$)</u> | <u>Option Awards (\$)(1)</u> | <u>Non-Equity Incentive Plan Compensation (\$)</u> | <u>All Other Compensation (\$)(2)</u> | <u>Total (\$)</u> |
|---|-------------|--------------------|-------------------|------------------------------|--|---------------------------------------|-------------------|
| Vincent J. Milano President and Chief Executive Officer | 2017 | 600,000 | — | 296,634 | 270,000 | 31,106 | 1,197,740 |
| | 2016 | 600,000 | — | 573,780 | 211,680 | 31,555 | 1,417,015 |
| | 2015 | 600,000 | — | —(3) | 288,120 | 32,950 | 921,070 |
| Louis J. Arcudi, III Senior Vice President of Operations, Chief Financial Officer Treasurer and Assistant Secretary | 2017 | 357,900 | — | 182,924 | 122,436 | 25,786 | 689,046 |
| | 2016 | 347,500 | — | 353,831 | 116,760 | 26,276 | 844,367 |
| | 2015 | 337,400 | — | —(3) | 132,261 | 26,989 | 496,650 |
| R. Clayton Fletcher Senior Vice President, Business Development and Strategy(4) | 2017 | 386,300 | — | 182,924 | 145,908 | 22,988 | 738,120 |
| | 2016 | 375,000 | — | 353,831 | 114,660 | 23,580 | 867,071 |
| | 2015 | 336,818 | — | 1,857,180(3) | 132,032 | 22,794 | 2,348,824 |
| Joanna Horobin Senior Vice President, Chief Medical Officer(5) | 2017 | 410,000 | — | 182,924 | 132,840 | 31,754 | 757,518 |
| | 2016 | 390,000 | — | — | 119,246 | 31,187 | 540,433 |
| | 2015 | 34,079 | — | 1,582,860(3) | 13,319 | 1,953 | 1,632,211 |
| Jonathan Yingling Senior Vice President, Chief Scientific Officer(6) | 2017 | 348,542 | — | 577,782 | 144,296 | 31,277 | 1,101,897 |
| Sudhir Agrawal, D. Phil. Former President of Research(7) | 2017 | 245,042 | 121,648(8) | 4,428,935(9) | — | 369,131 | 5,286,404 |
| | 2016 | 588,100 | — | 442,289 | 207,482 | 32,495 | 1,270,366 |
| | 2015 | 588,100 | — | —(3) | 302,577 | 33,172 | 923,849 |

- (1) Represents the aggregate grant date fair value of options granted to each of the named executive officers as computed in accordance with ASC 718. These amounts do not represent the actual amounts paid to or realized by the named executive officers. See Note 10 to the financial statements included in our Annual Report on Form 10-K for the year ended December 31, 2017 regarding assumptions we made in determining the fair value of option awards.

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- (2) "All Other Compensation" for 2017 for each of the named executive officers includes the following:

| | Premiums paid by us for all insurance plans (\$) | Company match on 401(k) (\$) | Severance (\$) | Total (\$) |
|--------------|---|---------------------------------|----------------|------------|
| Mr. Milano | 23,006 | 8,100 | — | 31,106 |
| Mr. Arcudi | 17,686 | 8,100 | — | 25,786 |
| Mr. Fletcher | 22,988 | — | — | 22,988 |
| Dr. Horobin | 23,654 | 8,100 | — | 31,754 |
| Dr. Yingling | 23,177 | 8,100 | — | 31,277 |
| Dr. Agrawal | 18,722 | 7,351 | 343,058 | 369,131 |

- (3) None of our named executive officers received an annual equity grant during 2015. Mr. Fletcher received an inducement grant of 600,000 options upon commencement of his employment in 2015. Dr. Horobin received an inducement grant of 275,000 options and a new hire grant of 325,000 options upon commencement of her employment in 2015.
- (4) Mr. Fletcher joined our company and became our Senior Vice President, Business Development and Strategy effective as of January 26, 2015.
- (5) Dr. Horobin joined our company and became our Senior Vice President, Chief Medical Officer effective as of November 30, 2015.
- (6) Dr. Yingling joined our company and became our Senior Vice President, Early Development effective as of February 6, 2017 and has served as our Chief Scientific Officer since January 1, 2018.
- (7) Dr. Agrawal served as our President of Research until his resignation, effective May 31, 2017.
- (8) Pursuant to Dr. Agrawal's separation agreement, Dr. Agrawal received a pro-rated cash bonus in 2017 calculated at 100% of his target 2017 bonus.
- (9) Amount consists of the aggregate grant date fair value of options granted to Dr. Agrawal during 2017 in the amount of \$182,924 as computed in accordance with ASC 718 and incremental fair value of outstanding options modified during 2017 in connection with Dr. Agrawal's separation agreement in the amount of \$4,246,211 as computed in accordance with ASC 718. See "Employment and Separation Agreements with our Named Executive Officers" for further information about continued vesting of Dr. Agrawal's options provided for in his separation agreement.

CEO Pay Ratio

Following is a reasonable estimate, prepared under applicable SEC rules, of the ratio of the annual total compensation of our CEO to the median of the annual total compensation of our other employees. We determined our median employee based on 2017 annual base salary and 2017 bonus awards for each of our 66 employees (excluding the CEO) as of December 31, 2017. The annual total compensation of our median employee (other than the CEO) for 2017 was \$218,372. As disclosed in the Summary Compensation Table, our CEO's annual total compensation for 2017 was \$1,197,740. Based on the foregoing, the ratio of the 2017 annual total compensation of our CEO to the median of the annual total compensation of all other employees was 6 to 1. Given the different methodologies that various public companies will use to determine an estimate of their pay ratio, the estimated ratio reported above should not be used as a basis for comparison between companies.

Grants of Plan-Based Awards

The following table sets forth information regarding grants of plan-based awards to our named executive officers during 2017.

Grants of Plan-Based Awards for Fiscal Year 2017

| Name | Grant Date | Estimated Possible Payouts Under Non-Equity Incentive Plan Awards | | | All Other Option Awards: Number of Securities Underlying Options (#)(1) | Exercise or Base Price of Option Awards (\$/Sh) | Grant Date Fair Value of Option Awards \$(2) |
|-----------------------------|-------------|--|-------------|--------------|--|---|--|
| | | Threshold (\$) | Target (\$) | Maximum (\$) | | | |
| Vincent J. Milano | 1/4/2017(3) | — | 300,000 | 468,750 | 300,000 | 1.59 | 296,634 |
| Louis J. Arcudi, III | 1/4/2017(3) | — | 143,200 | 223,750 | 185,000 | 1.59 | 182,924 |
| R. Clayton Fletcher | 1/4/2017(3) | — | 154,400 | 241,250 | 185,000 | 1.59 | 182,924 |
| Joanna Horobin | 1/4/2017(3) | — | 164,000 | 256,250 | 185,000 | 1.59 | 182,924 |
| Jonathan Yingling | 2/6/2017(3) | — | 139,417 | 217,839 | 600,000 | 1.55 | 577,782 |
| Sudhir Agrawal, D. Phil.(4) | 1/4/2017(3) | — | 121,648 | 190,075 | 185,000 | 1.59 | 182,924(5) |

- (1) The term of these options is ten years. The vesting of these stock options is time-based. See "Compensation Discussion and Analysis—Components of Executive Compensation—Equity Compensation" for a full description of the vesting terms for these options. See "Employment and Separation Agreements with our Named Executive Officers" for further information about acceleration of vesting of options in the event of the termination of employment and/or a change of control.
- (2) Represents the aggregate grant date fair value of option awards made to the named executive officers in 2017 as computed in accordance with ASC 718. These amounts do not represent the actual amounts paid to or realized by the named executive officers during 2017. See Note 10 to the financial statements included in our Annual Report on Form 10-K for the year ended December 31, 2017 regarding assumptions we made in determining the fair value of option awards.
- (3) Granted pursuant to our 2013 Stock Incentive Plan.
- (4) The target and maximum amounts reported under Estimated Possible Payouts Under Non-Equity Incentive Plan Awards for Dr. Agrawal are pro-rated for Dr. Agrawal's resignation effective May 31, 2017. Pursuant to the Separation Agreement and Release of Claims dated April 18, 2017 by and between Dr. Agrawal and us, Dr. Agrawal received a pro-rated bonus for 2017 in the amount of \$121,648 (100% of target).
- (5) Amount consists of the aggregate grant date fair value of options granted to Dr. Agrawal during 2017 in the amount of \$182,924 as computed in accordance with ASC 718 and excludes the incremental fair value of outstanding options modified during 2017 in connection with

Dr. Agrawal's separation agreement in the amount of \$4,246,211 as computed in accordance with ASC 718 as reflected in the "Summary Compensation Table for Fiscal Year 2017" shown above.

Outstanding Equity Awards at Fiscal Year-End

The following table sets forth information regarding the outstanding stock options held by our named executive officers as of December 31, 2017. None of our named executive officers held shares of unvested restricted stock as of December 31, 2017.

Outstanding Equity Awards at Fiscal Year-End for 2017

| Name | Number of Securities Underlying Unexercised Options (#) Exercisable | Number of Securities Underlying Unexercised Options (#) Unexercisable | Option Exercise Price (\$) | Option Expiration Date |
|-----------------------------|---|---|----------------------------|------------------------|
| Vincent J. Milano | 1,500,000 | 500,000(1) | 3.12 | 12/1/2024 |
| | 131,250 | 168,750(2) | 2.88 | 1/6/2026 |
| | — | 300,000(3) | 1.59 | 1/4/2027 |
| Louis J. Arcudi, III | 40,000 | — | 8.70 | 12/16/2018 |
| | 110,000 | — | 5.24 | 12/23/2019 |
| | 95,000 | — | 2.74 | 12/27/2020 |
| | 146,000 | — | 1.157 | 11/28/2021 |
| | 348,333 | — | 0.69 | 5/22/2023 |
| | 300,000 | — | 2.56 | 12/10/2023 |
| | 150,000 | 50,000(4) | 3.97 | 12/10/2024 |
| | 80,937 | 104,063(2) | 2.88 | 1/6/2026 |
| R. Clayton Fletcher | — | 185,000(3) | 1.59 | 1/4/2027 |
| | 412,500 | 187,500(5) | 4.67 | 1/26/2025 |
| | 80,937 | 104,063(2) | 2.88 | 1/6/2026 |
| Joanna Horobin | — | 185,000(3) | 1.59 | 1/4/2027 |
| | 300,000 | 300,000(6) | 3.88 | 11/30/2025 |
| Jonathan Yingling | — | 600,000(7) | 1.55 | 2/6/2027 |
| Sudhir Agrawal, D. Phil.(8) | 125,000 | — | 13.28 | 1/2/2018 |
| | 200,000 | — | 8.70 | 12/16/2018 |
| | 300,000 | — | 5.24 | 12/23/2019 |
| | 231,000 | — | 2.74 | 12/27/2020 |
| | 365,000 | — | 1.157 | 11/28/2021 |
| | 25,551 | — | 1.16 | 11/28/2021 |
| | 500,000 | — | 0.69 | 10/19/2022(9) |
| | 500,000 | — | 1.50 | 10/19/2022(9) |
| | 850,000 | — | 2.56 | 10/19/2022(9) |
| | 637,500 | 212,500(4) | 3.97 | 10/19/2022(9) |
| | 101,172 | 130,078(2) | 2.88 | 10/19/2022(9) |
| | — | 185,000(3) | 1.59 | 10/19/2022(9) |

(1) Represents unvested portion of stock option award that vested 25% on December 1, 2015 (first anniversary date following the December 1, 2014 grant date), with the remainder

- vesting in 12 equal quarterly installments thereafter (until December 1, 2018), provided the named executive officer is still employed with us on each vesting date.
- (2) Represents unvested portion of stock option award that vested 25% on January 6, 2017 (first anniversary date following the January 6, 2016 grant date), with the remainder vesting in 12 equal quarterly installments thereafter (until January 6, 2020), provided the named executive officer is still employed with us on each vesting date.
 - (3) Represents unvested portion of stock option award that will vest 25% on the first anniversary date following the January 4, 2017 grant date, with the remainder vesting in 12 equal quarterly installments thereafter (until January 4, 2021), provided the named executive is still employed with us on each vesting date.
 - (4) Represents unvested portion of stock option award that vested 25% on December 10, 2015 (first anniversary date following the December 10, 2014 grant date), with the remainder vesting in 12 equal quarterly installments thereafter (until December 10, 2018), provided the named executive officer is still employed with us on each vesting date.
 - (5) Represents unvested portion of stock option award that vested 25% on January 26, 2016 (first anniversary date following the January 26, 2015 grant date), with the remainder vesting in 12 equal quarterly installments thereafter (until January 26, 2019), provided the named executive officer is still employed with us on each vesting date.
 - (6) Represents unvested portion of stock option award that vested 25% on November 30, 2016 (first anniversary date following the November 30, 2015 grant date), with the remainder vesting in 12 equal quarterly installments thereafter (until November 30, 2019), provided the named executive officer is still employed with us on each vesting date.
 - (7) Represents unvested portion of stock option award that will vest 25% on the first anniversary date following the February 6, 2017 grant date, with the remainder vesting in 12 equal quarterly installments thereafter (until February 6, 2021), provided the named executive is still employed with us on each vesting date.
 - (8) Pursuant to our December 2014 letter agreement with Dr. Agrawal, the vesting of all stock options held by Dr. Agrawal as of the letter agreement date was accelerated to the extent that such options would have been vested had Dr. Agrawal continued to be employed by us on October 19, 2017. Stock options that remained unvested after giving effect to this acceleration continue to vest in accordance with the terms of the underlying stock option agreement.
 - (9) Pursuant to the separation agreement and release of claims by and between us and Dr. Agrawal, all stock options previously granted to Dr. Agrawal and held by Dr. Agrawal on his separation date will, to the extent not already vested, continue to vest to the extent such options or equity incentive awards, as applicable, would have vested had Dr. Agrawal continued to be an employee through October 19, 2019, and Dr. Agrawal will be entitled to exercise any such options until the earlier of the expiration of such option and October 19, 2022.

Option Exercises and Stock Vested

None of our named executive officers exercised any options during the year ended December 31, 2017.

Potential Payments Upon Termination or Change in Control

Under our employment agreement and employment offer letters with our executive officers, we have agreed to provide severance and other benefits in the event of the termination of their employment under specified circumstances. These agreements are described above under the caption "Employment and Separation Agreements with our Named Executive Officers."

However, in March 2017, we entered into a Severance and Change of Control Agreement with each of Messrs. Milano, Arcudi and Fletcher, and Drs. Horobin and Yingling that superseded the severance and change in control provisions of each of their respective employment offer letters. These agreements are also described above under the caption "Employment and Separation Agreements with our Named Executive Officers."

In April 2017, we entered into a separation agreement and release of claims with Dr. Agrawal, under which Dr. Agrawal agreed to resign, and did resign effective May 31, 2017, as our President of Research and as a member of our board of directors, and we agreed to provide him certain severance benefits and other compensation. This agreement is described above under the caption "Employment and Separation Agreements with our Named Executive Officers," and the payments upon Dr. Agrawal's resignation were paid in accordance with this agreement and are set forth above in the "Summary Compensation Table."

Termination of Employment Not In Connection With or Following a Change in Control

The following table sets forth the estimated potential benefits that our named executive officers would be entitled to receive upon their termination of employment with our company (other than a termination in connection with or following a change in control of our company) if the named executive officer's employment was terminated on December 29, 2017. This table represents estimates only and does not necessarily reflect the actual amounts that would be paid to our named executive officers, which would only be known at the time that they become eligible for payment following their termination.

Termination of Employment Not In Connection With or Following a Change in Control

| Name | Cash Severance(1) (S) | Perquisites/ Benefits(2) (S) | Total (S) |
|----------------------|-----------------------------|------------------------------------|--------------|
| Vincent J. Milano | 856,600 | 20,237 | 876,837 |
| Louis J. Arcudi, III | 481,719 | 14,912 | 496,631 |
| R. Clayton Fletcher | 520,338 | 20,237 | 540,575 |
| Joanna Horobin | 547,305 | 21,801 | 569,106 |
| Jonathan Yingling | 544,390 | 20,237 | 564,627 |

- (1) Cash severance under the Severance and Change of Control Agreements would be payable to Messrs. Milano, Arcudi and Fletcher, and Drs. Horobin and Yingling upon a termination of the executive's employment by the executive for "good reason" or by us without "cause", in either case, subject to the executive's timely execution and non-revocation of a general release of claims in a form provided by the Company and the executive's continued compliance with the invention, non-disclosure and non-competition agreement previously entered into in connection with the commencement of executive's employment. In such an event, executives would receive:
 - (i) a lump sum cash payment payable within 30 days after the date of termination equal to the greater of (1) the average bonus paid or earned and accrued, but unpaid to the executive in respect of the three fiscal years immediately preceding the year of termination, and (2) the annual bonus paid for the year immediately preceding the year of termination (\$256,600 for

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Mr. Milano, \$123,819 for Mr. Arcudi, \$134,038 for Mr. Fletcher, \$137,305 for Dr. Horobin and \$159,390 for Dr. Yingling); and

- (ii) salary continuation payments at the executive's base salary on termination date for a period of 12 months paid in accordance with the Company's normal payroll practices and subject to applicable tax withholding (\$600,000 for Mr. Milano, \$357,900 for Mr. Arcudi, \$386,300 for Mr. Fletcher, \$410,000 for Dr. Horobin and \$385,000 for Dr. Yingling).
- (2) Under the Severance and Change of Control Agreements, upon a qualifying termination by Messrs. Milano, Arcudi and Fletcher, and Drs. Horobin and Yingling, to the extent the executives participated in our group medical/dental insurance immediately prior to the termination date, if executives elect to continue receiving group medical and/or dental insurance under the continuation coverage rules known as COBRA, the Company will pay the Company's share of the premium for such coverage that it pays for active and similarly-situated employees who receive the same type of coverage until the end of the period for which the Company is paying the salary continuation payments described within note (1)(ii), above.

The payments described in this column include an estimated value of the employer share of the premiums for our insurance plans as follows:

| Name | Medical Insurance Premiums (\$) | Dental Insurance Premiums (\$) | Total (\$) |
|----------------------------|---------------------------------|--------------------------------|------------|
| Vincent J. Milano | 18,773 | 1,464 | 20,237 |
| Louis J. Arcudi, III | 13,448 | 1,464 | 14,912 |
| R. Clayton Fletcher | 18,773 | 1,464 | 20,237 |
| Joanna Horobin, M.B., Ch.B | 20,337 | 1,464 | 21,801 |
| Jonathan Yingling, Ph.D. | 18,773 | 1,464 | 20,237 |

Termination of Employment In Connection With or Following a Change in Control

The following table sets forth the estimated potential benefits that our named executive officers would be entitled to receive upon their termination of employment with our company in connection with or following a change in control of our company if the named executive officer's employment was terminated on December 29, 2017. The amounts indicated below are estimates based on the material assumptions described in the notes to the table below, which may or may not actually occur. Some of these assumptions are based on information currently available and, as a result, the actual amounts, if any, that may become payable to a named executive officer may differ in material respects from the amounts set forth below. Furthermore, for purposes of calculating such amounts, we have assumed:

- a change of control date of December 29, 2017;
- each named executive officer's employment is terminated by us without "cause" or by the named executive officer for "good reason", in each case on the date of the change of control; and
- the value of the accelerated vesting of any equity award is calculated assuming a market price per share of our common stock equal to \$2.11 (which equals the closing price of a share of our common stock on the Nasdaq Capital Market on December 29, 2017, the last trading day of 2017).

This table represents estimates only and does not necessarily reflect the actual amounts that would be paid to our named executive officers, which would only be known at the time that they become eligible for payment following their termination.

Termination of Employment In Connection With or Following a Change in Control

| <u>Name</u> | <u>Cash Severance(1)</u> <u>(\$)</u> | <u>Equity(2)</u> <u>(\$)</u> | <u>Perquisites/ Benefits(3)</u> <u>(\$)</u> | <u>Total</u> <u>(\$)</u> |
|----------------------|---|---------------------------------|--|-----------------------------|
| Vincent J. Milano | 1,650,000 | 156,000 | 30,356 | 1,836,356 |
| Louis J. Arcudi, III | 894,750 | 96,200 | 22,368 | 1,013,318 |
| R. Clayton Fletcher | 965,750 | 96,200 | 30,356 | 1,092,306 |
| Joanna Horobin | 1,025,000 | 96,200 | 32,702 | 1,153,902 |
| Jonathan Yingling | 933,361 | 336,000 | 30,356 | 1,299,717 |

- (1) Cash severance under the Severance and Change of Control Agreements would be payable to Messrs. Milano, Arcudi and Fletcher, and Drs. Horobin and Yingling upon a termination of the executive's employment by the executive for "good reason" or by us without "cause", in either case, within 24 months following a change of control (i.e., pursuant to a "double trigger" arrangement), subject to the executive's timely execution and non-revocation of a general release of claims in a form provided by the Company and the executive's continued compliance with the invention, non-disclosure and non-competition agreement previously entered into in connection with the commencement of executive's employment. In such an event, executives would receive a lump sum cash payment payable within 30 days after the date of termination equal to:
- (i) the executive's target bonus for the year of termination prorated for the portion of the year worked (\$300,000 for Mr. Milano, \$143,160 for Mr. Arcudi, \$154,520 for Mr. Fletcher, \$164,000 for Dr. Horobin and \$139,417 for Dr. Yingling); and
 - (ii) 150% of the sum of (a) such executive's annual base salary for the year immediately preceding the year of termination and (b) the greatest of (1) the average bonus paid or earned and accrued, but unpaid to the executive in respect of the three years immediately preceding the year of termination, (2) the annual bonus paid for the year immediately preceding the year of termination and (3) the target bonus for the year in which the termination occurs (\$1,350,000 for Mr. Milano, \$751,590 for Mr. Arcudi, \$811,230 for Mr. Fletcher, \$861,000 for Dr. Horobin and \$793,944 for Dr. Yingling).
- (2) Amounts in this column quantify the intrinsic value of the unvested stock options held by the named executive officers that would accelerate upon a qualifying termination of employment in connection with a change in control based on the assumptions described above.
- Under the Severance and Change of Control Agreements, upon a qualifying termination by Messrs. Milano, Arcudi and Fletcher, and Drs. Horobin and Yingling within 24 months following a change of control, all outstanding stock options held by the executive as of the date of termination will be automatically vested in full as of the date of termination, and the executive will have the ability to exercise any such options until the three year anniversary of such executive's termination, but in no event past the remaining term of the applicable equity award.
- (3) Under the Severance and Change of Control Agreements, upon a qualifying termination by Messrs. Milano, Arcudi and Fletcher, and Drs. Horobin and Yingling within 24 months following a change of control, the executive will be eligible to receive 150% of the Company's share of the annual premium for group medical and/or dental insurance coverage that was in place for the executive immediately prior to the date of termination, payable in a lump sum cash payment within 30 days after the date of termination.

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The payments described in this column include an estimated value of the employer share of the premiums for our insurance plans as follows:

| Name | Medical Insurance Premiums (\$) | Dental Insurance Premiums (\$) | Total (\$) |
|----------------------------|---------------------------------|--------------------------------|------------|
| Vincent J. Milano | 28,160 | 2,196 | 30,356 |
| Louis J. Arcudi, III | 20,172 | 2,196 | 22,368 |
| R. Clayton Fletcher | 28,160 | 2,196 | 30,356 |
| Joanna Horobin, M.B., Ch.B | 30,506 | 2,196 | 32,702 |
| Jonathan Yingling, Ph.D. | 28,160 | 2,196 | 30,356 |

EQUITY COMPENSATION PLAN INFORMATION

The following table provides information as of December 31, 2017 regarding total shares subject to outstanding stock options, warrants and rights and total additional shares available for issuance under our existing equity incentive and employee stock purchase plans. In addition, from time to time, we grant "inducement grants" pursuant to Nasdaq Listing Rule 5635(c)(4).

| Plan Category | Number of Securities to be Issued Upon Exercise of Outstanding Options, Warrants and Rights (a) | Weighted-Average Exercise Price of Outstanding Options, Warrants and Rights (b) | Number of Securities Remaining Available for Future Issuance Under Equity Compensation Plans (Excluding Securities Reflected in Column (a)) (c) |
|---|---|---|---|
| Equity compensation plans approved by stockholders(1) | 17,977,200 | \$ 2.86 | 13,500,778 |
| Equity compensation plans not approved by stockholders(2) | 3,425,000 | \$ 3.35 | — |
| Total | 21,402,200 | \$ 2.94 | 13,500,778 |

- (1) Consists of our: 1995 Director Stock Option Plan; 1997 Stock Incentive Plan; 2005 Stock Incentive Plan; 2008 Stock Incentive Plan; 2013 Stock Incentive Plan and 2017 Employee Stock Purchase Plan.

Shares are available for future issuance only under our 2013 Stock Incentive Plan and 2017 Employee Stock Purchase Plan.

- (2) Consists of stock options issued as inducement grants as of December 31, 2017. These stock options are generally subject to the same terms and conditions as those awarded pursuant to the plans approved by our stockholders.

PROPOSAL TWO

APPROVAL OF AN AMENDMENT TO OUR RESTATED CERTIFICATE OF INCORPORATION, AS AMENDED, TO EFFECT A REVERSE STOCK SPLIT OF OUR ISSUED AND OUTSTANDING COMMON STOCK BY A WHOLE NUMBER RATIO OF NOT LESS THAN 1-FOR-4 AND NOT MORE THAN 1-FOR-8, SUCH RATIO AND THE IMPLEMENTATION AND TIMING OF SUCH REVERSE STOCK SPLIT TO BE DETERMINED IN THE DISCRETION OF OUR BOARD OF DIRECTORS AT ANY TIME PRIOR TO OUR 2019 ANNUAL MEETING OF STOCKHOLDERS, AND, IN CONNECTION THEREWITH, TO DECREASE THE NUMBER OF AUTHORIZED SHARES OF OUR COMMON STOCK ON A BASIS PROPORTIONAL TO THE REVERSE STOCK SPLIT RATIO

General

We are asking stockholders to approve a proposal to amend our Restated Certificate of Incorporation, as amended, to effect a reverse stock split of our issued and outstanding common stock by a whole number ratio of not less than 1-for-4 and not more than 1-for-8, such ratio and the implementation and timing of such reverse stock split to be determined in the discretion of our board of directors, and, in connection therewith, to decrease the number of authorized shares of our common stock on a basis proportional to the reverse stock split ratio. At our 2017 special meeting of stockholders, we asked stockholders to approve, and stockholders did approve, a proposal similar to this Proposal Two. However, such approval expires upon the 2018 annual meeting. As a result, we are asking our stockholders to approve this proposal, which would have the effect of extending our board of directors' authority to implement a reverse stock split under these parameters until the 2019 annual meeting of stockholders. A reverse stock split would reduce the number of outstanding shares of our common stock, and the holdings of each stockholder, according to the same formula.

If this proposal is approved, the board of directors' present intention is to effect a reverse stock split of our issued and outstanding common stock by a whole number ratio of not less than 1-for-4 and not more than 1-for-8 prior to our 2019 annual meeting of stockholders. We are requesting authorization to effect the reverse stock split at the board of directors' discretion at any time prior to our 2019 annual meeting of stockholders to provide the board of directors with the flexibility to determine the appropriate ratio for, and timing to effect, the reverse stock split based upon our performance and market factors. However, the board of directors reserves its right to elect not to proceed and abandon the reverse stock split if it determines, in its sole discretion, that this proposal is no longer in the best interests of our stockholders.

We currently have 280,000,000 authorized shares of common stock. As of May 17, 2018, the record date for the 2018 annual meeting, 217,310,991 shares of common stock were issued and outstanding. "Authorized" shares represent the number of shares of common stock that we are permitted to issue under our Restated Certificate of Incorporation, as amended. This proposal, if implemented, would reduce both the number of issued and outstanding shares of common stock and the number of authorized shares of common stock by the ratio selected by the board of directors (within the parameters described), and, except for the effect of fractional shares, each stockholder's proportionate ownership interest in our company would be the same immediately before and after the reverse stock split. If Proposal Three is approved and implemented, which is subject to the approval and implementation of this proposal, the number of authorized shares of our common stock would, following the reverse stock split, be doubled.

If the Mergers described in Proposal One are consummated, shares of our common stock currently listed on the Nasdaq Capital Market will cease to be listed on the Nasdaq Capital Market and will be subsequently deregistered under the Exchange Act, and this Proposal Two and Proposal Three would not be implemented.

Reasons for the Reverse Stock Split

The board of directors is proposing a reverse stock split in order to reduce the number of issued and outstanding shares and to increase the per share trading value of our common stock. The board of directors believes that a reverse stock split is desirable and should be approved by stockholders for a number of reasons, including the reasons described below.

First, our board of directors believes that a reverse stock split may expand our audience of potential investors by increasing the per share stock price of our common stock. Some institutional investors have internal policies preventing the purchase of low-priced stocks. Similarly, non-solicitation rules at most broker-dealers prevent financial advisors or brokers within those firms from soliciting orders in low-priced stocks. In both cases, \$5.00 is a price level that is commonly set as the minimum price requirement for such institutions or broker-dealers to purchase common stock. On May 21, 2018, the last reported sale price of our common stock on the Nasdaq Capital Market was \$1.85. As a result, we believe that an increased per share stock price will enable additional participation in the trading of our common stock. In addition, while there may not be a specific price that defines a low-priced stock, we believe that stocks priced below \$5.00 are sometimes viewed with hesitation by some investors and their advisors. Price is frequently used as a proxy for "quality" and low-priced stocks are considered to potentially be of lower investing quality and/or less desirable relative to a company's peers with higher share prices. Additionally, because brokers' commissions on transactions in lower-priced stocks generally represent a higher percentage of the stock price than commissions on higher-priced stocks, the current average price per share of our common stock can result in individual stockholders paying transaction costs representing a higher percentage of their total share value than would be the case if the share price were higher. We believe that by implementing the reverse stock split, our common stock will not be viewed as a low-priced stock.

We also believe that the investors who are unable to or choose not to invest in our company because of our share price may be investors who are more oriented towards fundamentals and have a longer-term investment horizon. We believe that a higher share price and lower outstanding share count will increase the perceived quality and appeal of our common stock for investment purposes and may expand our audience of potential investors in general and increase our shareholder base of investors with longer term investment horizons specifically. In accomplishing this goal, we may also reduce share price volatility.

Certain Risks Associated with the Reverse Stock Split

In evaluating a reverse stock split, our board of directors also took into consideration certain risks associated with reverse stock splits, including the negative perception of reverse stock splits held by some investors, analysts and other stock market participants; the fact that the stock price of some companies that have effected reverse stock splits has subsequently declined back to pre-reverse stock split levels; and the risks described below.

There can be no assurance that the total market capitalization of our common stock (the aggregate value of our common stock at the then market price) after the implementation of a reverse stock split will be equal to or greater than the total market capitalization before the reverse stock split or that the per share market price of our common stock following a reverse stock split will increase in proportion to the reduction in the number of shares of our common stock outstanding before the reverse stock split.

There can be no assurance that the market price per new share of our common stock after a reverse stock split will remain unchanged or increase in proportion to the reduction in the number of shares of our common stock outstanding before the reverse stock split. For example, based on the closing price of our common stock on May 21, 2018, of \$1.85 per share, if the board of directors were to implement the reverse stock split and utilize a ratio of 1-for-6, we cannot assure you that the post-split market price of our common stock would be \$11.10 (that is, \$1.85 multiplied by 6) per share

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or greater. The market price of a company's shares may fluctuate and potentially decline after a reverse stock split.

Accordingly, the total market capitalization of our common stock after a reverse stock split when and if implemented may be lower than the total market capitalization before the reverse stock split. Moreover, in the future, the market price of our common stock following a reverse stock split may not exceed or remain higher than the market price prior to the reverse stock split.

If a reverse stock split is effected, the resulting per-share market price may not attract institutional investors or investment funds and may not satisfy the investing guidelines of such investors and, consequently, the trading liquidity of our common stock may not improve.

While the board of directors believes that a higher stock price may help generate investor interest, there can be no assurance that a reverse stock split will result in a per-share market price that will attract institutional investors or investment funds or that such share price will satisfy the investing guidelines of institutional investors or investment funds. As a result, the trading liquidity of our common stock may not necessarily improve.

A decline in the market price of our common stock after a reverse stock split is implemented may result in a greater percentage decline than would occur in the absence of a reverse stock split.

If a reverse stock split is effected and the market price of our common stock declines, the percentage decline may be greater than would occur in the absence of a reverse stock split. The market price of our common stock will, however, also be based upon our performance and other factors, which are unrelated to the number of shares of common stock outstanding.

The reverse stock split may reduce the liquidity and increase the volatility of our stock.

Following the reverse stock split, the number of our outstanding shares will be reduced by a whole number factor ranging from four to eight, which may lead to reduced trading and a smaller number of market makers for our common stock. Brokerage firms often do not permit stocks trading below \$5.00 per share to be sold short, but permit short-selling of shares which are traded at higher prices. Following the reverse stock split, to the extent our per-share trading price is consistently above \$5.00, investors may short our stock. This may increase the volatility of our stock price.

Principal Effects of this Proposal

If approved and implemented, the principal effects of this proposal would include the following:

- depending on the ratio for the reverse stock split selected by the board of directors (within the parameters described), each four to eight shares of common stock that you own will be reclassified into one share of common stock, the exact whole number ratio within the four to eight range to be determined by the board of directors;
- the number of shares of common stock issued and outstanding will be reduced proportionately based on the ratio selected by the board of directors;
- the total number of shares of common stock that we are authorized to issue will be reduced proportionately based on the ratio selected by the board of directors (which total number is subject to further change if the authorized common stock is set at the number described in Proposal Three);
- the number of shares reserved for issuance under our equity incentive plans will be reduced proportionately based on the ratio selected by the board of directors (and other appropriate adjustments or modifications will be made under the respective plans);

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- appropriate adjustments will be made to outstanding stock options granted under our equity incentive plans to maintain the economic value of the awards, as described below; and
- appropriate adjustments will be made to outstanding warrants.

If a reverse stock split is effected, the shares subject to outstanding stock options will be adjusted, in accordance with the provisions of the applicable equity incentive plan pursuant to which such awards were granted, using the ratio selected by the board of directors. The shares subject to such awards will be rounded down for any fractional shares. Additionally, the exercise price of any outstanding options will be multiplied by the ratio selected by the board of directors. For instance, using a 1-for-7 conversion ratio, if an employee has an option to purchase 1,400 shares at an exercise of \$2.50 per share, then after the reverse stock split is effected, such employee would hold an option to purchase 200 shares (or 1,400 shares divided by seven) at an exercise price of \$17.50 per share (or \$2.50 multiplied by seven).

In addition, if a reverse stock split is effected, the shares subject to outstanding warrants will be similarly adjusted, in accordance with the provisions of the applicable warrant, using the ratio selected by the board of directors. The shares subject to such warrants will be rounded down for any fractional shares.

A reverse stock split would affect all stockholders uniformly and would not alter any stockholder's percentage interest in our equity, except to the extent that a reverse stock split would result in some of our stockholders owning a fractional share as described below.

A reverse stock split would not, by itself, affect our assets or business prospects. The common stock resulting from the reverse stock split will remain fully paid and non-assessable. The reverse stock split will not affect the public registration of the common stock under the Exchange Act. The reverse stock split will also not affect our shares of preferred stock.

If approved and implemented, a reverse stock split may result in some stockholders owning "odd lots" of less than 100 shares of common stock. Odd lot shares may be more difficult to sell, and brokerage commissions and other costs of transactions in odd lots are generally somewhat higher than the costs of transactions in "round lots" of even multiples of 100 shares.

Assuming reverse stock split ratios of 1-for-4, 1-for-6 and 1-for-8, which reflect the low end, middle and high end of the range that our stockholders are being asked to approve, the following table sets forth (i) the number of shares of our common stock that would be issued and outstanding, (ii) the number of shares of common stock authorized (subject to Proposal Three), (iii) the aggregate number of shares of our common stock that would be reserved for issuance upon (a) conversion of our Series A convertible preferred stock, (b) exercise of outstanding warrants and (c) exercise of outstanding stock options and (iv) the number of shares of our common stock that would be reserved and available for future issuance under our equity incentive plans, each giving effect to the reverse

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stock split and based on securities outstanding as of April 30, 2018. Such amounts listed below are approximate as no fractional shares will be issued and share amounts will be rounded down.

| | Number of Shares Before Reverse Stock Split | Reverse Stock Split Ratio of 1-for-4 | Reverse Stock Split Ratio of 1-for-6 | Reverse Stock Split Ratio of 1-for-8 |
|--|--|--|--|--|
| Number of Shares of Common Stock Issued and Outstanding | 217,310,991 | 54,327,747 | 36,218,498 | 27,163,873 |
| Number of Shares of Common Stock Authorized (subject to Proposal Three) | 280,000,000 | 70,000,000 | 46,666,666 | 35,000,000 |
| Number of Shares of Common Stock Reserved for Issuance Upon Conversion or Exercise of Outstanding Securities | 45,708,429 | 11,427,106 | 7,618,071 | 5,713,552 |
| Number of Shares of Common Stock Reserved and Available for Future Issuance Under Our Equity Incentive Plans | 10,992,455 | 2,748,113 | 1,832,075 | 1,374,056 |

Treatment of Fractional Shares

No fractional shares will be issued in connection with a reverse stock split. Stockholders who otherwise would be entitled to receive fractional shares because they hold a number of shares of common stock not evenly divisible by the number selected by the board of directors for a reverse stock split ratio will be entitled, upon surrender of any certificate(s) representing such shares, to a cash payment (without interest) in lieu thereof equal to the fraction of one share of common stock that such holder would otherwise be entitled to receive multiplied by the closing price per share of our common stock on the first trading day that commences after the reverse stock split is effective on the Nasdaq Capital Market.

Stockholders who receive a cash payment in lieu of such fractional shares will no longer have any rights as a stockholder with respect to such shares.

Accounting Matters

The par value of our common stock will remain unchanged at \$0.001 per share after a reverse stock split. The reverse stock split will not affect total assets, liabilities or shareholders' equity. However, the per share net income or loss and net book value of the common stock will be retroactively increased for each period because there will be fewer shares of common stock outstanding.

Procedure for Effecting a Reverse Stock Split and Exchange of Stock Certificates

If stockholders approve the proposal to amend our Restated Certificate of Incorporation, as amended, and the board of directors determines to implement the reverse stock split (with the ratio to be determined in the discretion of the board of directors within the parameters described), we will file with the Secretary of State of the State of Delaware a Certificate of Amendment of Restated Certificate of Incorporation, as amended, in the form attached hereto as Appendix A, or the Certificate of Amendment, reflecting such reverse stock split ratio determined by the board of directors. The reverse stock split will become effective at the time and on the date of filing of, or at such later time as is specified in, the Certificate of Amendment, which we refer to as the "effective time" and the "effective date," respectively. The effective time of the Certificate of Amendment will be determined in the discretion of our board of directors and in accordance with applicable law. Beginning at the effective time, each certificate representing shares of common stock will be deemed for all corporate purposes to evidence ownership of the number of whole shares into which the shares previously represented by the certificate were combined pursuant to the reverse stock split.

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Our board of directors has approved the amendment to our Restated Certificate of Incorporation, as amended. The ratio of the reverse stock split, within the parameters described, and the implementation and timing of such reverse stock split will be determined in the discretion of our board of directors.

Following any reverse stock split, stockholders holding physical certificates would need to exchange those certificates. As we are now fully participating in the direct registration system, you will not receive a replacement physical certificate. Instead you will receive uncertificated shares and a written confirmation from our transfer agent, Computershare Trust Company, N.A., indicating the whole number of uncertificated shares you own after the effect of the reverse stock split and a cash payment in lieu of any fractional shares. Our common stock will also receive a new CUSIP number.

If a reverse stock split is implemented, our transfer agent will advise registered stockholders of the procedures to be followed to exchange certificates in a letter of transmittal to be sent to stockholders. No written confirmations will be issued to a stockholder until the stockholder has surrendered the stockholder's outstanding certificate(s), together with the properly completed and executed letter of transmittal, to our transfer agent. Any old shares submitted for transfer, whether pursuant to a sale, other disposition or otherwise, will automatically be exchanged for new shares. **Stockholders should not destroy any stock certificate(s) and should not submit any certificate(s) until requested to do so.**

Certain of our registered stockholders hold some or all of their shares electronically in book-entry form with our transfer agent. These stockholders do not hold physical certificates evidencing their ownership of our common stock. However, they are provided with a statement reflecting the number of shares of our common stock registered in their accounts. If a stockholder holds shares of common stock in book-entry form with our transfer agent, no action needs to be taken to receive post-reverse stock split shares or payment in lieu of fractional shares, if applicable. If a stockholder is entitled to post-reverse stock split shares, a transaction statement will automatically be sent to the stockholder's address of record indicating the number of shares of our common stock held following the reverse stock split.

Upon a reverse stock split, we intend to treat stockholders holding our common stock in "street name," through a broker, bank or other nominee, in the same manner as registered stockholders whose shares are registered in their names. Brokers, banks or other nominees will be instructed to effect a reverse stock split for their beneficial holders holding our common stock in "street name." However, these brokers, banks or other nominees may have different procedures than registered stockholders for processing a reverse stock split. If you hold your shares with a broker, bank or other nominee and if you have any questions in this regard, we encourage you to contact your nominee.

No Appraisal Rights

Stockholders do not have appraisal rights under the Delaware General Corporation Law or under our Restated Certificate of Incorporation, as amended, in connection with the reverse stock split.

Reservation of Right to Abandon the Amendment to our Restated Certificate of Incorporation, as amended

Our board of directors reserves the right to abandon the amendment to our Restated Certificate of Incorporation, as amended, described in this Proposal Two without further action by our stockholders at any time before the effective time, even if stockholders approve such amendment at the 2018 annual meeting. By voting in favor of the amendment to our Restated Certificate of Incorporation, as amended, stockholders are also expressly authorizing the board of directors to determine not to proceed with, and abandon, a reverse stock split if it should so decide.

Material U.S. Federal Income Tax Consequences of the Reverse Stock Split

The following discussion is a summary of the material U.S. federal income tax consequences of the proposed reverse stock split to U.S. Holders (as defined below) of our common stock. This discussion is based on the Code, U.S. Treasury Regulations promulgated thereunder, judicial decisions, and published rulings and administrative pronouncements of the U.S. Internal Revenue Service, which we refer to as the IRS, in each case in effect as of the date of this proxy statement. These authorities may change or be subject to differing interpretations. Any such change or differing interpretation may be applied retroactively in a manner that could adversely affect a U.S. Holder. We have not sought and will not seek any rulings from the IRS regarding the matters discussed below and there can be no assurance the IRS or a court will not take a contrary position to that discussed below regarding the tax consequences of the proposed reverse stock split.

For purposes of this discussion, a "U.S. Holder" is a beneficial owner of our common stock that, for U.S. federal income tax purposes, is or is treated as (i) an individual who is a citizen or resident of the United States; (ii) a corporation (or any other entity or arrangement treated as a corporation) created or organized under the laws of the United States, any state thereof, or the District of Columbia; (iii) an estate, the income of which is subject to U.S. federal income tax regardless of its source; or (iv) a trust if (1) its administration is subject to the primary supervision of a court within the United States and all of its substantial decisions are subject to the control of one or more "United States persons" (within the meaning of Section 7701(a)(30) of the Code), or (2) it has a valid election in effect under applicable U.S. Treasury regulations to be treated as a United States person.

This discussion is limited to U.S. Holders who hold our common stock as a "capital asset" within the meaning of Section 1221 of the Code (generally, property held for investment). This discussion does not address all U.S. federal income tax consequences relevant to the particular circumstances of a U.S. Holder, including the impact of the Medicare contribution tax on net investment income. In addition, it does not address consequences relevant to U.S. Holders that are subject to special rules, including, without limitation, financial institutions, insurance companies, real estate investment trusts, regulated investment companies, grantor trusts, tax-exempt organizations, dealers or traders in securities or currencies, stockholders who hold our common stock as part of a position in a straddle or as part of a hedging, conversion or integrated transaction for U.S. federal income tax purposes, U.S. Holders that have a functional currency other than the U.S. dollar, or U.S. Holders who actually or constructively own 10% or more of our voting stock.

If a partnership (or other entity treated as a partnership for U.S. federal income tax purposes) is the beneficial owner of our common stock, the U.S. federal income tax treatment of a partner in the partnership will generally depend on the status of the partner and the activities of the partnership. Accordingly, partnerships (and other entities treated as partnerships for U.S. federal income tax purposes) holding our common stock and the partners in such entities should consult their own tax advisors regarding the U.S. federal income tax consequences of the proposed reverse stock split to them.

In addition, the following discussion does not address the U.S. federal estate and gift tax, alternative minimum tax, or state, local and non-U.S. tax law consequences of the proposed reverse stock split. Furthermore, the following discussion does not address any tax consequences of transactions effectuated before, after or at the same time as the proposed reverse stock split, whether or not they are in connection with the proposed reverse stock split.

Each stockholder should consult his, her or its own tax advisors concerning the particular U.S. federal tax consequences of the reverse stock split, as well as the consequences arising under the laws of any other taxing jurisdiction, including any state, local or foreign income tax consequences.

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The proposed reverse stock split is intended to be treated as a "recapitalization" for U.S. federal income tax purposes pursuant to Section 368(a)(1)(E) of the Code. As a result, a U.S. Holder generally should not recognize gain or loss upon the proposed reverse stock split for U.S. federal income tax purposes, except with respect to cash received in lieu of a fractional share of our common stock, as discussed below. A U.S. Holder's aggregate adjusted tax basis in the shares of our common stock received pursuant to the proposed reverse stock split should equal the aggregate adjusted tax basis of the shares of our common stock exchanged therefor (reduced by the amount of such basis that is allocated to any fractional share of our common stock). The U.S. Holder's holding period in the shares of our common stock received pursuant to the proposed reverse stock split should include the holding period in the shares of our common stock exchanged therefor. U.S. Treasury Regulations provide detailed rules for allocating the tax basis and holding period of shares of common stock surrendered in a recapitalization to shares received in the recapitalization. U.S. Holders of shares of our common stock acquired on different dates and at different prices should consult their tax advisors regarding the allocation of the tax basis and holding period of such shares.

A U.S. Holder that, pursuant to the proposed reverse stock split, receives cash in lieu of a fractional share of our common stock should recognize capital gain or loss in an amount equal to the difference, if any, between the amount of cash received and the portion of the U.S. Holder's aggregate adjusted tax basis in the shares of our common stock surrendered that is allocated to such fractional share. Such capital gain or loss will be short term if the pre-reverse stock split shares were held for one year or less at the effective time of the reverse stock split and long term if held for more than one year. No gain or loss will be recognized by us as a result of the proposed reverse stock split.

A U.S. Holder of our common stock may be subject to information reporting and backup withholding on cash paid in lieu of a fractional share in connection with the proposed reverse stock split. A U.S. Holder of our common stock will be subject to backup withholding if such U.S. Holder is not otherwise exempt and such U.S. Holder does not provide its taxpayer identification number in the manner required or otherwise fails to comply with applicable backup withholding tax rules. Backup withholding is not an additional tax. Any amounts withheld under the backup withholding rules may be refunded or allowed as a credit against a U.S. Holder's federal income tax liability, if any, provided the required information is timely furnished to the IRS. U.S. Holders of our common stock should consult their own tax advisors regarding their qualification for an exemption from backup withholding and the procedures for obtaining such an exemption.

The U.S. federal income tax discussion set forth above does not discuss all aspects of U.S. federal income taxation that may be relevant to a particular stockholder in light of such stockholder's circumstances and income tax situation. **Accordingly, we urge you to consult with your own tax advisor with respect to all of the potential U.S. federal, state, local and foreign tax consequences to you of the reverse stock split.**

Recommendation of the Board of Directors

Our board of directors unanimously recommends that the stockholders vote FOR the proposal to amend our Restated Certificate of Incorporation, as amended, to effect a reverse stock split of our issued and outstanding common stock by a whole number ratio of not less than 1-for-4 and not more than 1-for-8, such ratio and the implementation and timing of such reverse stock split to be determined in the discretion of our board of directors at any time prior to our 2019 annual meeting of stockholders, and, in connection therewith, to decrease the number of authorized shares of our common stock on a basis proportional to the reverse stock split ratio.

PROPOSAL THREE

APPROVAL OF AN AMENDMENT TO OUR RESTATED CERTIFICATE OF INCORPORATION, AS AMENDED, TO SET THE NUMBER OF AUTHORIZED SHARES OF OUR COMMON STOCK AT A NUMBER DETERMINED BY CALCULATING THE PRODUCT OF 280,000,000 MULTIPLIED BY TWO TIMES (2X) THE REVERSE STOCK SPLIT RATIO

General

In April 2018, our board of directors approved, subject to stockholder approval and the implementation of the reverse stock split described in Proposal Two, an additional amendment to our Restated Certificate of Incorporation, as amended, to set the number of authorized number of shares of our common stock at a number determined by calculating the product of 280,000,000 multiplied by two times (2x) the reverse stock split ratio. If Proposal Two and Proposal Three are approved and the reverse stock split is implemented then, effectively, upon such split, the number of our authorized shares of common stock will be decreased proportionally to the reverse stock split ratio, and then such decreased amount will be increased by 200%.

Our board of directors believes that, if Proposal Three is not approved, following the implementation of a reverse stock split of our issued and outstanding common stock and the proportionate decrease in our authorized common stock as described in Proposal Two, we would have limited flexibility to issue shares of common stock in connection with possible future financings, joint ventures, acquisitions, stock incentive plans and other general corporate purposes. As a result, our board of directors believes that a 2x increase in our authorized common stock in such instance is in our and our stockholders' best interests because it will provide us with that flexibility. We do not currently have any plans, understandings, arrangements, commitments or agreements, written or oral, for the issuance of the additional shares of common stock that would be authorized if this proposal is approved. However, we desire to have the shares available to provide additional flexibility to use our common stock for business and financial purposes in the future as well to have sufficient shares available to provide appropriate equity incentives for our employees.

Proposal Three is subject to, and conditioned upon, approval of the amendment to our Restated Certificate of Incorporation, as amended, to effect the reverse stock split in Proposal Two. If the reverse stock split pursuant to Proposal Two and the amendment pursuant to this Proposal Three are approved by the requisite vote of our stockholders, and our board of directors determines to implement such proposals, the change in the number of shares of our authorized common stock would become effective upon the date and time set by our board of directors, as set forth in the amendment to our Restated Certificate of Incorporation, as amended, to be filed with the Secretary of State of the State of Delaware. In addition, our board of directors reserves the right, notwithstanding stockholder approval and without further action by our stockholders, to abandon the amendment if, at any time prior to the effectiveness of the filing of the amendment with the Secretary of State, our board of directors, in its sole discretion, determines that it is no longer in our best interest and the best interests of our stockholders to proceed. Our board of directors does not anticipate receiving further authorization from stockholders for the issuance of any newly authorized shares, except as required by applicable laws, rules and regulations.

The form of the proposed amendment to our Restated Certificate of Incorporation, as amended, to effect the reverse stock split and set the number of authorized shares of our common stock at a number determined by calculating the product of 280,000,000 multiplied by two times (2x) the reverse stock split ratio is attached as Appendix A to this proxy statement. Any amendment to our Restated Certificate of Incorporation, as amended, to set the number of authorized shares of our common stock at a certain number will be based on the reverse stock split ratio fixed by our board of directors, within the range approved by our stockholders pursuant to Proposal Two.

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If the Mergers described in Proposal One are consummated, shares of our common stock currently listed on the Nasdaq Capital Market will cease to be listed on the Nasdaq Capital Market and will be subsequently deregistered under the Exchange Act, and Proposal Two and this Proposal Three would not be implemented.

Effect of the Proposal

We currently have 280,000,000 shares of common stock authorized for issuance under our Restated Certificate of Incorporation, as amended. Assuming (i) reverse stock split ratios of 1-for-4, 1-for-6 and 1-for-8, which reflect the low end, middle and high end of the range that our stockholders are being asked to approve, and (ii) that the number of our authorized shares of common stock is reduced proportionally to the reverse stock split ratios of 1-for-4, 1-for-6 and 1-for-8 and then subsequently increased by 2x as provided in this Proposal Three, the following table sets forth (a) the number of shares of our common stock that would be authorized, (b) the number of shares of our common stock that would be issued and outstanding, (c) the aggregate number of shares of our common stock that would be reserved for issuance upon (1) conversion of our Series A convertible preferred stock, (2) exercise of outstanding warrants and (3) exercise of outstanding stock options and (d) the number of shares of our common stock that would be reserved and available for future issuance under our equity incentive plans, each giving effect to the reverse stock split and based on securities outstanding as of April 30, 2018. The following table also sets forth the number of shares of our common stock that would be authorized if this Proposal Three is not approved. Such amounts listed below are approximate as no fractional shares will be issued and share amounts will be rounded down.

| | Number of Shares Reserved Before Reverse Stock Split | Reverse Stock Split Ratio of 1-for-4 | Reverse Stock Split Ratio of 1-for-6 | Reverse Stock Split Ratio of 1-for-8 |
|---|--|--|--|--|
| Number of Shares of Common Stock Authorized, if Proposal Three Is Approved(a) | 280,000,000 | 140,000,000 | 93,333,332 | 70,000,000 |
| Number of Shares of Common Stock Authorized, if Proposal Three Is NOT Approved | 280,000,000 | 70,000,000 | 46,666,666 | 35,000,000 |
| Number of Shares of Common Stock Issued and Outstanding(b) | 217,310,991 | 54,327,747 | 36,218,498 | 27,163,873 |
| Number of Shares of Common Stock Reserved for Issuance Upon Conversion or Exercise of Outstanding Securities(c) | 45,708,429 | 11,427,106 | 7,618,071 | 5,713,552 |
| Number of Shares of Common Stock Reserved and Available for Future Issuance Under Our Equity Incentive Plans(d) | 10,992,455 | 2,748,113 | 1,832,075 | 1,374,056 |

The additional shares of authorized common stock would have the same rights and privileges as the shares of common stock currently issued and outstanding. Holders of our common stock have no preemptive rights.

Reservation of Right to Abandon the Amendment to our Restated Certificate of Incorporation, as amended

Our board of directors reserves the right to abandon the amendment to our Restated Certificate of Incorporation, as amended, described in this Proposal Three without further action by our stockholders at any time before the effective time, even if stockholders approve such amendment at the 2018 annual meeting.

Recommendation of the Board of Directors

Our board of directors unanimously recommends that stockholders vote FOR the proposal to amend our Restated Certificate of Incorporation, as amended, to set the number of authorized shares of our common stock at a number determined by calculating the product of 280,000,000 multiplied by two times (2x) the reverse stock split ratio.

PROPOSAL FOUR

APPROVAL, BY NON-BINDING VOTE, OF EXECUTIVE COMPENSATION

We are providing our stockholders the opportunity to vote to approve, on an advisory, non-binding basis, the compensation of our named executive officers as disclosed in this proxy statement in accordance with the SEC's rules. This proposal, which is commonly referred to as "say on pay," is required by the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, which added Section 14A to the Exchange Act. Consistent with the preference expressed by our stockholders at our 2017 annual meeting of stockholders, we have determined to hold an advisory vote on executive compensation annually.

The compensation committee of our board of directors seeks to achieve the following broad goals in connection with our executive compensation programs and decisions regarding individual compensation:

- attract, retain and motivate the best possible executive talent;
- ensure executive compensation is aligned with our corporate strategies and business objectives, including our short-term operating goals and longer-term strategic objectives;
- promote the achievement of key strategic and financial performance measures by linking short- and long-term cash and equity incentives to the achievement of measurable corporate and individual performance goals; and
- align executives' incentives with the creation of stockholder value.

Our compensation program for our executives generally consists of five elements based upon the foregoing objectives:

- base salary;
- annual cash bonuses;
- stock option awards;
- health care, life insurance and other employee benefits; and
- severance and change in control benefits.

The value of our variable, performance-based compensation is split between short-term compensation in the form of a cash bonus and long-term compensation in the form of stock option awards that vest over time from the date of grant of the option awards and from the time of achievement of performance milestones. The annual cash bonus is intended to provide an incentive to our executives to achieve short-term operational objectives. The stock option awards provide an incentive for our executives to achieve longer-term strategic business goals, which should lead to higher stock prices and increased stockholder value.

The "Executive Compensation" section set forth elsewhere in this proxy statement, including the "Compensation Discussion and Analysis," describes in detail our executive compensation programs and the decisions made by the compensation committee and the board of directors with respect to the fiscal year ended December 31, 2017.

Our board of directors is asking stockholders to approve a non-binding advisory vote on the following resolution:

RESOLVED, that the compensation paid to the company's named executive officers, as disclosed pursuant to the compensation disclosure rules of the Securities and Exchange Commission, including

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the compensation discussion and analysis, the compensation tables and any related material disclosed in this proxy statement, is hereby approved.

As an advisory vote, this proposal is not binding. The outcome of this advisory vote will not overrule any decision by us or our board of directors (or any committee thereof), create or imply any change to our fiduciary duties or the fiduciary duties of our board of directors (or any committee thereof), or create or imply any additional fiduciary duties on us or our board of directors (or any committee thereof). However, our compensation committee and board of directors value the opinions expressed by our stockholders in their vote on this proposal and will consider the outcome of the vote when making future compensation decisions for named executive officers.

Recommendation of the Board of Directors

Our board of directors unanimously recommends that stockholders vote to approve the compensation of our named executive officers by voting FOR this proposal.

PROPOSAL FIVE

RATIFICATION OF SELECTION OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

The audit committee of our board of directors has selected the firm of Ernst & Young LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2018. Ernst & Young LLP has served as our independent registered public accounting firm since 2002. Although stockholder approval of the audit committee's selection of Ernst & Young LLP is not required by law, our board of directors believes that it is advisable to give stockholders an opportunity to ratify this selection. If this proposal is not approved at the 2018 annual meeting, the audit committee of our board of directors may reconsider its selection.

Representatives of Ernst & Young LLP are expected to be present at the 2018 annual meeting. They will have the opportunity to make a statement if they desire to do so and will also be available to respond to appropriate questions from stockholders.

Recommendation of the Board of Directors

Our board of directors unanimously recommends that you vote FOR the ratification of the selection of Ernst & Young LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2018.

ACCOUNTING MATTERS**Independent Registered Public Accounting Firm Fees**

The following table sets forth all fees paid or accrued by us for professional services rendered by Ernst & Young LLP during the years ended December 31, 2017 and 2016:

| <u>Fee Category</u> | <u>2017</u> | <u>2016</u> |
|---------------------|-------------------|-------------------|
| Audit Fees | \$ 600,122 | \$ 828,737 |
| Audit-Related Fees | 204,814 | 119,330 |
| Tax Fees | 126,980 | 28,780 |
| All Other Fees | 1,995 | 1,995 |
| Total Fees | <u>\$ 933,911</u> | <u>\$ 978,842</u> |

Audit Fees

Audit fees represent the aggregate fees billed for professional services rendered by our independent registered public accounting firm for the audit of our annual financial statements and internal controls over financial reporting, review of financial statements included in our quarterly reports on Form 10-Q and services that are normally provided in connection with statutory and regulatory filings or engagements.

Audit-Related Fees

Audit-related fees represent the aggregate fees billed for assurance and related professional services rendered by our independent registered public accounting firm that are reasonably related to the performance of the audit or review of our financial statements and that are not reported under "Audit Fees" including consultations regarding internal controls, financial accounting and reporting standards; the issuance of consents in connection with registration statement filings with the SEC and comfort letters in connection with securities offerings.

Tax Fees

Tax fees represent the aggregate fees billed for professional services rendered by our independent registered public accounting firm for tax compliance, tax advice and tax planning services. Tax compliance services, which relate to preparation of tax returns, accounted for \$25,000 of the total tax fees billed in both 2017 and 2016. Tax advice and tax planning services primarily relate to consultations on our net operating loss carry forwards and payroll taxes.

All Other Fees

All other fees represent the aggregate fees billed for all other products and services rendered by our independent registered public accounting firm other than the services reported in the other categories. All other fees for all periods presented related to our subscription to Ernst & Young's online accounting research tool.

Our audit committee believes that the non-audit services described above did not compromise Ernst & Young LLP's independence. Our audit committee charter, which you can find by clicking "Investors" and "Corporate Governance" on our website, www.iderapharma.com, requires that all proposals to engage Ernst & Young LLP for services, and all proposed fees for these services, be submitted to the audit committee for approval before Ernst & Young LLP may provide the services.

Pre-Approval Policies and Procedures

Our audit committee has adopted policies and procedures relating to the approval of all audit and non-audit services that are to be performed by our independent registered public accounting firm. This policy generally provides that we will not engage our independent registered public accounting firm to render audit or non-audit services unless the service is specifically approved in advance by the audit committee or the engagement is entered into pursuant to the pre-approval procedures described below.

From time to time, the audit committee may pre-approve specified types of services that are expected to be provided to us by our independent registered public accounting firm during the next 12 months. Any such pre-approval is detailed as to the particular service or type of services to be provided and is also generally subject to a maximum dollar amount. All of the services described above under the headings "Audit Fees," "Audit-Related Fees," "Tax Fees" and "All Other Fees" were pre-approved by our audit committee.

TRANSACTIONS WITH RELATED PERSONS

Since January 1, 2017, except as discussed below regarding transactions with (i)(a) 667, L.P., Baker Brothers Life Sciences, L.P. and 14159, L.P., which we refer to collectively as the Funds, and (b) Baker Bros. Advisors L.P., or BBA, which, in each case, are affiliated with Mr. Baker and Dr. Neu, who are currently members of our board of directors, and (ii) Pillar Invest Corporation, which is affiliated with Mr. El Zein, who was a member of our board of directors until October 2017, we have not entered into or engaged in any related party transactions, as defined by the SEC, with our directors, officers and stockholders who beneficially owned more than 5% of our outstanding common stock, as well as affiliates or immediate family members of those directors, officers and stockholders. We believe that the terms of our transactions described below were no less favorable than those that we could have obtained from unaffiliated third parties.

Public Offering

On October 30, 2017, we completed a follow-on underwritten public offering, in which we sold 33,333,334 shares of common stock at a price to the public of \$1.50 per share for aggregate gross proceeds of \$50.0 million. On November 1, 2017, we sold an additional 5,000,000 shares of common stock pursuant to the exercise in full of the underwriters' 30-day option to purchase additional shares of our common stock at the public offering price less the underwriting discount. We refer to this offering as the 2017 Offering. The net proceeds to us from the 2017 Offering, including the exercise by the underwriters of their option to purchase additional shares and after deducting underwriters' discounts and commissions and other offering costs and expenses, were approximately \$53.7 million.

Certain affiliates of the Funds participated in the 2017 Offering and purchased in the aggregate 8,000,000 shares of our common stock at the price offered to the public for an aggregate purchase price of \$12.0 million.

Policies and Procedures for Related Person Transactions

Our board of directors is committed to upholding the highest legal and ethical conduct in fulfilling its responsibilities and recognizes that related party transactions can present a heightened risk of potential or actual conflicts of interest. Accordingly, as a general matter, it is our preference to avoid related party transactions.

In accordance with our audit committee charter, members of the audit committee, all of whom are independent directors, review and approve all related party transactions for which approval is required under applicable laws or regulations, including SEC and the Nasdaq Listing Rules. Current SEC rules define a related party transaction to include any transaction, arrangement or relationship in which we

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are a participant and the amount involved exceeds \$120,000, and in which any of the following persons has or will have a direct or indirect interest:

- our executive officers, directors or director nominees;
- any person who is known to be the beneficial owner of more than 5% of our common stock;
- any person who is an immediate family member, as defined under Item 404 of Regulation S-K, of any of our executive officers, directors or director nominees or beneficial owners of more than 5% of our common stock; or
- any firm, corporation or other entity in which any of the foregoing persons is employed or is a partner or principal or in a similar position or in which such person, together with any other of the foregoing persons, has a 5% or greater beneficial ownership interest.

In addition, the audit committee reviews and investigates any matters pertaining to the integrity of management, including conflicts of interest and adherence to our code of business conduct and ethics. Under our code of business conduct and ethics, our directors, officers and employees are expected to avoid any relationship, influence or activity that would cause or even appear to cause a conflict of interest. Under our code of business conduct and ethics, a director is required to promptly disclose to our board of directors any potential or actual conflict of interest involving him or her. In accordance with our code of business conduct and ethics, the board of directors will determine an appropriate resolution on a case-by-case basis. All directors must recuse themselves from any discussion or decision affecting their personal, business or professional interests.

SECTION 16(a) BENEFICIAL OWNERSHIP REPORTING COMPLIANCE

Section 16(a) of the Exchange Act requires our directors, officers and the holders of more than 10% of our common stock, which we refer to collectively as reporting persons, to file with the SEC initial reports of ownership of our common stock and other equity securities on a Form 3 and reports of changes in such ownership on a Form 4 or Form 5. Reporting persons are required by SEC regulations to furnish us with copies of all Section 16(a) forms they file. To our knowledge, based solely on a review of our records and written representations by the persons required to file these reports, during 2017, the reporting persons complied with all Section 16(a) filing requirements.

By order of the board of directors,

/s/ LOUIS J. ARCUDI, III

Louis J. Arcudi, III,
Senior Vice President of Operations, Chief Financial Officer, Treasurer and Assistant Secretary

May 22, 2018

**CERTIFICATE OF AMENDMENT
TO THE
RESTATED CERTIFICATE OF INCORPORATION
OF
IDERA PHARMACEUTICALS, INC.**

(Pursuant to Section 242 of the
General Corporation Law of the State of Delaware)

Idera Pharmaceuticals, Inc. (hereinafter called the "Corporation"), a corporation organized and existing under and by virtue of the General Corporation Law of the State of Delaware, does hereby certify as follows:

FIRST: A resolution was duly adopted by the Board of Directors of the Corporation pursuant to Section 242 of the General Corporation Law of the State of Delaware setting forth a proposed amendment to the Restated Certificate of Incorporation of the Corporation, as amended, and declaring said amendment to be advisable. The stockholders of the Corporation duly approved said proposed amendment in accordance with Section 242 of the General Corporation Law of the State of Delaware. The resolution setting forth the amendment is as follows:

RESOLVED: That the first paragraph of Article FOURTH of the Restated Certificate of Incorporation of the Corporation, as amended, be and hereby is deleted in its entirety and the following is inserted in lieu thereof:

"FOURTH. Effective upon the effective time of this Certificate of Amendment to the Restated Certificate of Incorporation pursuant to the General Corporation Law of the State of Delaware (the "Effective Time"), a one-for-⁽¹⁾ reverse stock split of the Corporation's common stock, \$.001 par value per share (the "Common Stock"), shall become effective, pursuant to which each ⁽²⁾ shares of Common Stock issued or outstanding (including treasury shares) immediately prior to the Effective Time shall be reclassified and combined into one validly issued, fully paid and nonassessable share of Common Stock automatically and without any action by the Corporation or the holder thereof upon the Effective Time and shall represent one share of Common Stock from and after the Effective Time (such reclassification and combination of shares, the "Reverse Stock Split"). The par value of the Common Stock following the Reverse Stock Split shall remain at \$.001 per share. No fractional shares of Common Stock shall be issued as a result of the Reverse Stock Split and, in lieu thereof, upon surrender after the Effective Time of a certificate which formerly represented shares of Common Stock that were issued and outstanding immediately prior to the Effective Time, any person who would otherwise be entitled to a fractional share of Common Stock as a result of the Reverse Stock Split, following the Effective Time, shall be entitled to receive a cash payment (without interest) equal to the fraction of a share of Common Stock to which such holder would otherwise be entitled multiplied by the closing price per share of the Common Stock on the Nasdaq Capital Market on the first trading day that commences after the Reverse Stock Split is effective on the Nasdaq Capital Market.

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- (1) Shall be a whole number equal to or greater than four and equal to or less than eight.
- (2) If a one-for-four reverse stock split, four.
If a one-for-five reverse stock split, five.
If a one-for-six reverse stock split, six.
If a one-for-seven reverse stock split, seven.
If a one-for-eight reverse stock split, eight.

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Each stock certificate that, immediately prior to the Effective Time, represented shares of Common Stock that were issued and outstanding immediately prior to the Effective Time shall, from and after the Effective Time, automatically and without the necessity of presenting the same for exchange, represent that number of whole shares of Common Stock after the Effective Time into which the shares formerly represented by such certificate have been reclassified (as well as the right to receive cash in lieu of fractional shares of Common Stock as set forth above); provided, however, that each person of record holding a certificate that represented shares of Common Stock that were issued and outstanding immediately prior to the Effective Time shall receive, upon surrender of such certificate, if any, a written confirmation from the Corporation's transfer agent indicating the number of whole shares of Common Stock after the Effective Time into which the shares of Common Stock formerly represented by such certificate shall have been reclassified as well as any cash in lieu of fractional shares to which such holder may be entitled as set forth above.

The total number of shares of all classes of stock which the Corporation shall have authority to issue is (i) ()⁽³⁾ shares of Common Stock, \$.001 par value per share, and (ii) Five Million (5,000,000) shares of Preferred Stock, \$.01 par value per share ("Preferred Stock"), which may be issued from time to time in one or more series as set forth in Part B of this Article FOURTH."

SECOND: This Certificate of Amendment shall be effective at 5:00 p.m., Eastern time, on , 201 .

IN WITNESS WHEREOF, the Corporation has caused this Certificate of Amendment to be signed by its duly authorized officer this day of , 201 .

IDERA PHARMACEUTICALS, INC.

By: _____

Vincent J. Milano
President and Chief Executive Officer

(3) If stockholders only approve Proposal Two (reverse stock split) and:

- If a one-for-four reverse stock split, 70,000,000.
- If a one-for-five reverse stock split, 56,000,000.
- If a one-for-six reverse stock split, 46,666,666.
- If a one-for-seven reverse stock split, 40,000,000.
- If a one-for-eight reverse stock split, 35,000,000.

If stockholders approve both Proposal Two (reverse stock split) and Proposal Three (increase in authorized shares) and:

- If a one-for-four reverse stock split, 140,000,000.
- If a one-for-five reverse stock split, 112,000,000.
- If a one-for-six reverse stock split, 93,333,332.
- If a one-for-seven reverse stock split, 80,000,000.
- If a one-for-eight reverse stock split, 70,000,000.

▼ IF YOU HAVE NOT VOTED VIA THE INTERNET OR TELEPHONE, FOLD ALONG THE PERFORATION, DETACH AND RETURN THE BOTTOM PORTION IN THE ENCLOSED ENVELOPE. ▼

Proxy — IDERA PHARMACEUTICALS, INC.

PROXY SOLICITED BY THE BOARD OF DIRECTORS

Annual Meeting of Stockholders — June 20, 2018

Those signing on the reverse side, revoking all prior proxies, hereby appoint(s) Mr. Vincent J. Milano and Mr. Louis J. Arcudi, III, or each or any of them with full power of substitution, as proxies for those signing on the reverse side to act and vote all shares of stock of Idera Pharmaceuticals, Inc. which the undersigned would be entitled to vote if personally present at the 2018 Annual Meeting of Stockholders of Idera Pharmaceuticals, Inc. (the "Meeting") and at any adjournment or postponement thereof as indicated upon all matters referred to on the reverse side and described in the Proxy Statement for the Meeting, and, in their discretion, upon any other matters which may properly come before the Meeting. Attendance of the undersigned at the Meeting or at any adjournment or postponement thereof will not be deemed to revoke this proxy unless those signing on the reverse side shall revoke this proxy in writing.

THIS PROXY WHEN PROPERLY EXECUTED WILL BE VOTED IN THE MANNER DIRECTED BY THE STOCKHOLDER(S) SIGNING THE REVERSE SIDE AND IN THE DISCRETION OF THE PROXIES UPON ANY OTHER MATTERS WHICH PROPERLY COME BEFORE THE MEETING. IF NO INDICATION IS MADE, THE PROXIES SHALL VOTE "FOR" THE DIRECTOR NOMINEES AND "FOR" PROPOSALS NUMBERED 2, 3, 4, AND 5.

PLEASE VOTE, DATE AND SIGN ON OTHER SIDE AND RETURN PROMPTLY IN ENCLOSED ENVELOPE.

YOUR VOTE IS IMPORTANT. PLEASE VOTE TODAY.

