

## SCHEDULE 14A INFORMATION

**Proxy Statement Pursuant to Section 14(a) of the  
Securities Exchange Act of 1934**

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Filed by the Registrant

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Check the appropriate box:

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

**ASSEMBLY BIOSCIENCES, INC.**

(Name of Registrant as Specified In Its Charter)

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Payment of Filing Fee (Check the appropriate box)

- No fee required.
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1. Title of each class of securities to which transaction applies:

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**ASSEMBLY BIOSCIENCES, INC.**  
**11711 N. Meridian Street, Suite 310**  
**Carmel, Indiana 46032**

**NOTICE OF ANNUAL MEETING OF STOCKHOLDERS**  
**To Be Held Friday, May 17, 2019**

April 4, 2019

**Dear Stockholders:**

You are cordially invited to attend the Annual Meeting of Stockholders (the Annual Meeting) of Assembly Biosciences, Inc., a Delaware corporation (we, us, Assembly or the Company). The Annual Meeting will be held at our offices at 331 Oyster Point Blvd., Fourth Floor, South San Francisco, CA 94080 on Friday, May 17, 2019 at 8:00 a.m. Pacific Daylight Time (PDT) for the following purposes:

1. To elect the nine nominees named in the attached proxy statement to our Board of Directors;
2. To approve, on a non-binding advisory basis, our named executive officers' compensation, as disclosed in the proxy statement accompanying this notice;
3. To ratify the selection of Ernst & Young LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2019;
4. To approve an amendment to the Assembly Biosciences, Inc. 2018 Stock Incentive Plan to, among other things, increase the number of shares reserved for issuance thereunder by 1,100,000 shares; and
5. To vote on such other matters that may properly come before the meeting and any adjournment or postponement thereof.

These matters are more fully described in the proxy statement accompanying this notice.

Our Board of Directors has fixed the close of business on March 22, 2019 as the record date for the determination of stockholders entitled to notice of and to vote at the Annual Meeting and any adjournment or postponement thereof. Please see the attached proxy statement for information on how to obtain directions to attend the Annual Meeting and vote in person.

To ensure your representation at the Annual Meeting, you are requested to submit your vote as instructed in the Important Notice Regarding the Availability of Proxy Materials that will be sent to you. You may also request a paper proxy card at any time on or before May 3, 2019 to submit your vote by mail. If you attend the Annual Meeting and file with our Corporate Secretary an instrument revoking your proxy or a duly executed proxy bearing a later date, your proxy will not be used.

**Important Notice Regarding the Availability of Proxy Materials for the Annual Meeting to be held on  
 Friday, May 17, 2019 at 8:00 a.m. PDT at Assembly's offices located at  
 331 Oyster Point Blvd., Fourth Floor, South San Francisco, California 94080.**

**The Proxy Statement and the Annual Report for the fiscal year ended December 31, 2018  
 are available at: [www.proxyvote.com](http://www.proxyvote.com).**

We hope that you will attend the meeting in person on May 17, 2019, and we very much appreciate your continuing interest in our Company.

By Order of the Board of Directors,

Derek A. Small  
 President and Chief Executive Officer

**You are cordially invited to attend the Annual Meeting in person. Whether or not you expect to attend the Annual Meeting, please complete, date, sign and return the proxy card mailed to you, or vote over the telephone or the Internet as instructed in the Important Notice Regarding the Availability of Proxy Materials that you will receive in the mail, or vote by mail by requesting a printed copy of the proxy card, as promptly as possible to ensure your representation at the Annual Meeting. Even if you have voted by proxy, you may still vote in person if you attend the Annual Meeting. Please note, however, that if your shares are held of record by a broker, bank or other nominee and you wish to vote at the Annual Meeting, you must obtain a proxy issued in your name from that record holder.**



**ASSEMBLY BIOSCIENCES, INC.  
331 Oyster Point Blvd., Fourth Floor  
South San Francisco, California 94080**

**PROXY STATEMENT**

**FOR THE 2019 ANNUAL MEETING OF STOCKHOLDERS**

**MAY 17, 2019**

**INFORMATION CONCERNING SOLICITATION AND VOTING**

The Board of Directors (the Board) of Assembly Biosciences, Inc., a Delaware corporation (we, us, Assembly or the Company) is soliciting your proxy to vote at the 2019 Annual Meeting of Stockholders (the Annual Meeting) to be held at our offices at 331 Oyster Point Blvd., Fourth Floor, South San Francisco, CA 94080 on Friday, May 17, 2019 at 8:00 a.m. Pacific Daylight Time (PDT), including any adjournments or postponements of the meeting. You are invited to attend the Annual Meeting to vote on the proposals described in this proxy statement. However, you do not need to attend the meeting to vote your shares. Instead, you may follow the instructions in the Proxy Availability Notice described below to submit your proxy over the telephone or through the Internet, or you may vote by mail by using the proxy card provided or requesting a printed copy of the proxy card.

We sent an Important Notice Regarding the Availability of Proxy Materials (the Proxy Availability Notice) on or about April 4, 2019 to our stockholders of record and beneficial owners as of March 22, 2019, the record date for the meeting. The proxy materials, including this proxy statement, proxy card or voting instruction card and our Annual Report for the fiscal year ended December 31, 2018 are being distributed and made available on or about April 4, 2019. This proxy statement contains important information for you to consider when deciding how to vote on the matters brought before the Annual Meeting. Please read it carefully.

This proxy statement and the Proxy Availability Notice contain instructions for accessing and reviewing our proxy materials on the Internet and for voting by proxy over the Internet, by phone or by mail. The Proxy Availability Notice and the proxy card will also provide instructions on how you can elect to receive future proxy materials electronically or in printed form by mail. If you choose to receive future proxy materials electronically, you will receive an email next year with instructions containing a link to the proxy materials and a link to the proxy voting site. Your election to receive proxy materials electronically or in printed form by mail will remain in effect until you terminate such election. You will need to obtain your own Internet access if you choose to access the proxy materials and/or vote over the Internet. If you prefer to receive printed copies of our proxy materials, the Proxy Availability Notice contains instructions on how to request the materials by mail. For stockholders who have elected to receive proxy materials electronically, you will not receive printed copies of the proxy materials unless you request them. If you elect to receive the materials by mail, you may also vote by proxy on the proxy card or voter instruction card that you will receive in response to your request.

Choosing to receive future proxy materials electronically will allow us to provide you with the information you need more rapidly, will save us the cost of printing and mailing documents to you and will conserve natural resources.

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**QUESTIONS AND ANSWERS ABOUT THESE PROXY MATERIALS AND VOTING****Why did I receive the Important Notice Regarding the Availability of Proxy Materials instead of a full set of proxy materials?**

In accordance with the rules and regulations adopted by the U.S. Securities and Exchange Commission (SEC), we have elected to provide access to our proxy materials over the Internet instead of mailing a printed copy of our proxy materials to each stockholder. Accordingly, we sent an Important Notice Regarding Availability of Proxy Materials (the Proxy Availability Notice) on or about April 4, 2019 to most stockholders of record entitled to vote at the Annual Meeting. Stockholders may access the proxy materials on a website referred to in the Proxy Availability Notice commencing on or about April 4, 2019 or may request a printed set of the proxy materials be sent to them by following the instructions in the Proxy Availability Notice.

**Why did I receive a full set of proxy materials and the Important Notice Regarding the Availability of Proxy Materials?**

We are providing paper copies of the proxy materials to stockholders who have previously requested to receive them in paper form or for whom an election to receive proxy materials electronically by email or over the Internet are not on file in writing. If you would like to reduce the environmental impact and the costs incurred by us in mailing proxy materials, you may elect to receive all future proxy materials electronically by email or over the Internet. To sign up for electronic delivery, please follow the instructions provided with your proxy materials and on your proxy card or voting instruction card for using the Internet and, when prompted, indicate that you agree to receive or access future stockholder communications electronically. Alternatively, you can go to [www.proxyvote.com](http://www.proxyvote.com) and enroll for online delivery of Annual Meeting and proxy materials.

**What does it mean if I receive more than one Proxy Availability Notice?**

If you receive more than one Proxy Availability Notice, your shares may be registered in more than one name or in different accounts. Please follow the voting instructions on each Proxy Availability Notice to ensure that all of your shares are voted. All of your shares may be voted at [www.proxyvote.com](http://www.proxyvote.com) regardless of which account they are registered or held in.

**How do I attend the Annual Meeting?**

Admission to the meeting will be limited to our stockholders of record, persons holding proxies from our stockholders of record and beneficial owners of our common stock. If you wish to attend and vote at the Annual Meeting, you must bring: (1) valid photo identification, such as a driver's license or passport; and (2) evidence of stock ownership as of March 22, 2019 (the Record Date), such as an account statement, proxy card or voting information form. If your shares are held through a broker, bank or other nominee, you must bring proof of your ownership of the shares. This could consist of, for example, a bank or brokerage firm account statement or a letter from your bank or broker confirming your ownership as of the record date. Cameras, recording devices, and other electronic devices will not be permitted at the Annual Meeting. For directions to the Annual Meeting, please contact John Gunderson at [jgunderson@assemblybio.com](mailto:jgunderson@assemblybio.com) or 1-833-509-4583.

**Who can vote at the Annual Meeting?**

Only stockholders of record at the close of business on March 22, 2019 will be entitled to vote at the Annual Meeting. On the Record Date, there were 25,549,757 shares of common stock outstanding and entitled to vote.

*Stockholder of Record: Shares Registered in Your Name*

If on March 22, 2019, your shares were registered directly in your name with our transfer agent, VStock Transfer, LLC, then you are a stockholder of record. As a stockholder of record, you may vote in person at the meeting or vote by proxy. Whether or not you plan to attend the meeting, we urge you to fill out and return your proxy card or vote by proxy over the telephone or Internet as instructed below to ensure your vote is counted.

*Beneficial Owner: Shares Registered in the Name of a Broker or Bank*

If on March 22, 2019, your shares were held not in your name, but rather in an account at a broker, bank or other similar organization, then you are the beneficial owner of shares held in “street name” and the Proxy Availability Notice is being forwarded to you by that organization. The organization holding your account is considered to be the stockholder of record for purposes of voting at the Annual Meeting. As a beneficial owner, you have the right to direct your broker or other agent regarding how to vote the shares in your account. You are also invited to attend the Annual Meeting. However, since you are not the stockholder of record, you may not vote your shares in person at the meeting unless you request and obtain a valid proxy from your broker or other agent.

**What am I voting on?**

There are four matters scheduled for a vote:

1. Election of nine directors;
2. Approval, on a non-binding advisory basis, of our named executive officers’ compensation, as disclosed in this proxy statement in accordance with SEC rules;
3. Ratification of the selection by the Audit Committee of the Board of Ernst & Young LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2019; and
4. Approval of an amendment to the Assembly Biosciences, Inc. 2018 Stock Incentive Plan (the 2018 Plan) to, among other things, increase the number of shares reserved for issuance thereunder by 1,100,000 shares.

**What if another matter is properly brought before the meeting?**

The Board knows of no other matters that will be presented for consideration at the Annual Meeting. If any other matters are properly brought before the meeting, it is the intention of the persons named in the accompanying proxy to vote on those matters in accordance with their best judgment.

**How do I vote?**

You may either vote “For” our nominees to the Board or you may “Withhold” your vote for the nominees. For each of the other matters to be voted on, you may vote “For” or “Against” or abstain from voting.

The procedures for voting depend upon whether your shares are registered in your name or are held by a bank, broker or other nominee:

*Stockholder of Record: Shares Registered in Your Name*

If you are a stockholder of record, you may vote in person at the Annual Meeting, vote by proxy using a proxy card that we have provided, that you may request or that we may elect to deliver at a later time, vote by proxy over the telephone or vote by proxy over the Internet. Whether or not you plan to attend the meeting, we urge you to vote by proxy to ensure your vote is counted. You may still attend the meeting and vote in person even if you have already voted by proxy.

- To vote in person, come to the Annual Meeting, and we will give you a ballot when you arrive.
- To vote using a proxy card, simply complete, sign and date the proxy card and return it pursuant to the instructions provided. Your vote must be received by May 16, 2019 to be counted.
- To vote over the telephone, dial toll-free 1-800-690-6903 using a touch-tone phone and follow the recorded instructions. You will be asked to provide the company control number from your proxy card or Proxy Availability Notice. Your vote must be received by 11:59 p.m. Eastern Daylight Time (EDT) on May 16, 2019 to be counted.

- To vote over the Internet, go to [www.proxyvote.com](http://www.proxyvote.com) to complete an electronic proxy card. You will be asked to provide the company control number from your proxy card. Your vote must be received by 11:59 p.m. EDT on May 16, 2019 to be counted.

*Beneficial Owner: Shares Registered in the Name of Broker or Bank*

If you are a beneficial owner of shares registered in the name of your broker, bank, or other nominee, you should have received a Proxy Availability Notice containing a voting instruction form from that organization rather than from us. Simply complete and mail the voting instruction form provided with the Proxy Availability Notice to ensure that your vote is counted.

- To vote in person at the Annual Meeting, contact your broker, bank or other nominee to obtain a valid proxy from that institution.
- To vote using the voting instruction form accompanying the Proxy Availability Notice, simply complete, sign and date the voting instruction form and return it pursuant to the instructions provided. Your vote must be received by May 16, 2019 to be counted.
- To vote over the telephone, dial toll-free 1-800-690-6903 using a touch-tone phone and follow the recorded instructions. You will be asked to provide the company control number from your voting instruction form or Proxy Availability Notice. Your vote must be received by 11:59 p.m. EDT on May 16, 2019 to be counted.
- To vote over the Internet, go to [www.proxyvote.com](http://www.proxyvote.com) to complete an electronic proxy. You will be asked to provide the company control number from your voting instruction form. Your vote must be received by 11:59 p.m. EDT on May 16, 2019 to be counted.

**Internet proxy voting is provided to allow you to vote your shares online, with procedures designed to ensure the authenticity and correctness of your proxy vote instructions. However, please be aware that you must bear any costs associated with your Internet access, such as usage charges from Internet access providers and telephone companies.**

**How many votes do I have?**

On each matter to be voted upon, you have one vote for each share of common stock you own as of March 22, 2019.

**Who is paying for this proxy solicitation?**

We will pay for the entire cost of soliciting proxies. In addition to these proxy materials, our directors and employees may also solicit proxies in person, by telephone or by other means of communication. Directors and employees will not be paid any additional compensation for soliciting proxies. We may also reimburse brokerage firms, banks and other nominees for their reasonable out-of-pocket expenses for forwarding proxy materials to beneficial owners and seeking instruction with respect thereto.

**Can I vote my shares by filling out and returning the Proxy Availability Notice?**

No. The Proxy Availability Notice will, however, provide instructions on how to vote by Internet, telephone, mail (by requesting a paper proxy card or voting instruction card), and in person at the Annual Meeting.

If you receive a proxy statement and a paper proxy card together with the Proxy Availability Notice, the paper proxy card may be used to vote your shares.



### **Can I change my vote or revoke my proxy after submitting my proxy?**

#### *Stockholder of Record: Shares Registered in Your Name*

Yes. You can change your vote or revoke your proxy at any time before the deadline to vote. If you are the record holder of your shares, you may change your vote or revoke your proxy in any one of the following ways:

- You may submit another properly completed proxy card with a later date.
- You may grant a subsequent proxy by telephone or over the Internet.
- You may send a timely written notice that you are revoking your proxy to our Corporate Secretary at 11711 N. Meridian Street, Suite 310, Carmel, Indiana 46032.
- You may attend the Annual Meeting and vote in person. Simply attending the meeting will not, by itself, revoke your proxy.

Your most current vote (prior to the deadline) by proxy card or telephone or Internet proxy is the one that is counted.

#### *Beneficial Owner: Shares Registered in the Name of Broker, Bank*

Yes. You can change your vote or revoke your voting instruction form at any time before the deadline to vote. If your shares are held by your broker or bank as a nominee or agent, you should follow the instructions provided by your broker, bank or other nominee. Note however, you may also revoke your proxy in any one of the following ways:

- You may grant a subsequent voting instruction by telephone or over the Internet.
- You may attend the Annual Meeting and vote in person if you request and obtain a valid proxy from your broker, bank or other nominee. Simply attending the meeting will not, by itself, revoke your voting instruction form.

Your most current vote (prior to the deadline) by voting instruction form or telephone or Internet proxy is the one that is counted.

### **How are votes counted?**

Votes will be counted by the inspector of election appointed for the meeting, who will separately count (1) for the proposal to elect directors, votes “FOR,” “WITHHOLD” and broker non-votes and (2) with respect to other proposals, votes “FOR” and “AGAINST,” abstentions and, if applicable, broker non-votes. “WITHHOLD” votes will have no effect and will not be counted towards the election of directors. With respect to the other proposals, abstentions will be counted towards the vote total for each proposal and will have the same effect as “AGAINST” votes. Broker non-votes will be counted to determine whether a quorum is present at the Annual Meeting. Broker non-votes will have no effect and will not be counted towards the vote total for Proposal No. 1, Proposal No. 2 and Proposal No. 4.

### **What are “broker non-votes”?**

Broker non-votes occur when a beneficial owner of shares held in “street name” does not give voting instructions to the broker, bank or other nominee holding the shares as to how to vote on matters deemed “non-routine.” Generally, if shares are held in street name, the beneficial owner of the shares is entitled to give voting instructions to the broker, bank or other nominee holding the shares. If the beneficial owner does not provide voting instructions, the broker, bank or other nominee can still vote the shares with respect to matters that are considered to be “routine,” but not with respect to “non-routine” matters. Under the rules and interpretations of Nasdaq, “non-routine” matters are matters that may substantially affect the rights or privileges of stockholders, such as mergers, stockholder proposals, elections of directors (even if not contested) and executive compensation, including the advisory stockholder votes on executive compensation and on the frequency of stockholder votes on executive compensation. The only “routine” matter on the agenda for the Annual Meeting is Proposal No. 3 — Ratification of the Selection of the

Independent Registered Public Accounting Firm. Accordingly, the “non-routine” matters on the agenda for the Annual Meeting are Proposal No. 1 — Election of Directors, Proposal No. 2 — Advisory Vote to Approve Our Named Executive Officers’ Compensation and Proposal No. 4 — Approval of an Amendment to the Assembly Biosciences, Inc. 2018 Stock Incentive Plan.

Broker non-votes will be counted to determine whether a quorum is present at the Annual Meeting. However, because broker non-votes are not considered under Delaware law to be entitled to vote at the Annual Meeting, they will have no effect on the outcome of the vote on Proposal No. 1 — Election of Directors, Proposal No. 2 — Advisory Vote to Approve Our Named Executive Officers’ Compensation or Proposal No. 4 — Approval of an Amendment to the Assembly Biosciences, Inc. 2018 Stock Incentive Plan. As a result, if you hold your shares in street name and you do not instruct your broker, bank or other nominee how to vote your shares on any of the proposals listed above, no votes will be cast on your behalf on these proposals. Therefore, it is critical that you indicate your vote on these proposals if you want your vote to be counted.

**What if I return a proxy card or otherwise vote but do not make specific choices?**

If you return a signed and dated proxy card or otherwise vote without marking voting selections, your shares will be voted:

- (1) “FOR” the election of the nine director nominees identified in this proxy statement;
- (2) “FOR” the approval, on a non-binding advisory basis, of our named executive officers’ compensation;
- (3) “FOR” the ratification of the selection of Ernst & Young LLP as our registered independent public accounting firm for the fiscal year ending December 31, 2019;
- (4) “FOR” the approval of an amendment to the 2018 Plan; and
- (5) To transact such other business as may properly come before the Annual Meeting and any adjournments or postponements thereof as determined in the discretion of your proxyholder;

**What is the quorum requirement?**

A quorum of stockholders is necessary to hold a valid meeting. A quorum will be present if stockholders holding a majority of the outstanding shares entitled to vote as of the Record Date are present at the meeting in person or represented by proxy. On the Record Date, there were 25,549,757 shares of common stock outstanding and entitled to vote. Thus, the holders of 12,774,879 shares must be present in person or represented by proxy at the meeting to have a quorum.

Your shares will be counted towards the quorum only if you submit a valid proxy (or one is submitted on your behalf by your broker, bank or other nominee) by May 16, 2019 or if you vote in person at the meeting. Abstentions and broker non-votes will be counted towards the quorum requirement. If there is no quorum, the holders of a majority of shares present at the meeting in person or represented by proxy may adjourn the meeting to another date.

Once a share is represented for any purpose at the Annual Meeting, it is deemed present for quorum purposes for the remainder of the meeting and any adjournment thereof unless a new record date is set for the adjournment.

**How many votes are needed to approve each proposal?**

Assuming the presence of a quorum at the Annual Meeting, the following sets forth the votes necessary for each of the proposals being submitted to the stockholders:

<b>Proposal</b>	<b>Description</b>	<b>Vote Required</b>	<b>Discretionary Voting Allowed</b>
No. 1	Election of Nine Directors	Plurality	No
No. 2	Advisory Vote on Named Executive Officers' Compensation	Majority Present & Entitled to Vote	No
No. 3	Ratification of the Selection of Ernst & Young LLP as Independent Registered Public Accounting Firm for 2019	Majority Present & Entitled to Vote	Yes
No. 4	Amendment to the 2018 Plan	Majority Present & Entitled to Vote	No

The election of directors will be determined by a plurality of the votes cast at the Annual Meeting. This means that the nine nominees receiving the highest number of "FOR" votes will be elected as directors. "WITHHOLD" votes and broker non-votes, if any, are not treated as votes cast, and therefore will have no effect on the proposal to elect directors.

With regard to the votes: (1) to approve, on an advisory basis, our named executive officers' compensation; (2) to ratify the selection of Ernst & Young LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2019; and (3) to approve an amendment to the 2018 Plan, a "Majority Present & Entitled to Vote" standard means the affirmative vote of the holders of a majority of the shares of common stock present in person or represented by proxy at the Annual Meeting and entitled to vote on such matter is required for the proposal to pass. For purposes of determining whether the proposal has passed, abstentions will be treated as votes cast against the proposal, but broker non-votes will have no impact on the outcome of the proposal.

Accordingly, assuming a quorum is present:

- Proposal No. 1: For the election of directors, the nine nominees receiving the highest number of "FOR" votes from the holders of shares present in person or represented by proxy at the Annual Meeting and entitled to vote on Proposal No. 1 will be elected. Only votes "FOR" will affect the outcome. "WITHHOLD" votes and broker non-votes will have no effect on the outcome of the election of directors.
- Proposal No. 2: To be approved, a majority of the shares of common stock held by holders present in person or represented by proxy at the Annual Meeting and entitled to vote on Proposal No. 2 must be voted "FOR" the advisory approval of our named executive officers' compensation. Abstentions will be deemed a vote against Proposal No. 2. Broker non-votes will not be considered towards vote totals on Proposal No. 2 and will have no effect on the outcome of the vote.
- Proposal No. 3: To be approved, a majority of the shares of common stock held by holders present in person or represented by proxy at the Annual Meeting and entitled to vote on Proposal No. 3 must be voted "FOR" the ratification of the selection of Ernst & Young LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2019. Abstentions will be deemed a vote against Proposal No. 3. Broker non-votes will not be considered towards vote totals on Proposal No. 3; however, the ratification of the selection of Ernst & Young LLP is a matter on which a broker, bank or other nominee has discretionary voting authority, so we do not expect any broker non-votes with respect to Proposal No. 3.
- Proposal No. 4: To be approved, a majority of the shares of common stock held by holders present in person or represented by proxy at the Annual Meeting and entitled to vote on Proposal No. 4 must be voted "FOR" approval of the amendment to the 2018 Plan. Abstentions will be deemed a vote against Proposal No. 4. Broker non-votes will not be considered towards vote totals on Proposal No. 4.

**How can I find out the results of the voting at the Annual Meeting?**

Preliminary voting results will be announced at the Annual Meeting. In addition, final voting results will be reported in a Current Report on Form 8-K that we expect to file within four business days after the Annual Meeting. If final voting results are not available to us in time to file a Form 8-K within four business days after the meeting, we intend to file a Form 8-K to report preliminary results and, within four business days after the final results are known to us, file an additional Form 8-K to report the final results.

**What proxy materials are available on the Internet?**

The proxy statement and our Annual Report for the fiscal year ended December 31, 2018 are available free of charge at [www.proxyvote.com](http://www.proxyvote.com). You can request a copy of our Annual Report free of charge by calling 1-833-509-4583 or sending an email to our Corporate Secretary at [CorpSecretary@assemblybio.com](mailto:CorpSecretary@assemblybio.com). Please include your contact information with the request.

Our Annual Report on Form 10-K for the fiscal year ended December 31, 2018 as filed with the SEC, is accessible free of charge on our website. It contains audited consolidated financial statements covering our fiscal years ended December 31, 2018, 2017 and 2016. The Annual Report on Form 10-K, without exhibits, is included in the 2018 Annual Report to Stockholders that is available with this proxy statement.

**SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS**

This proxy statement contains forward-looking statements. These statements relate to future events or our future financial performance and involve known and unknown risks, uncertainties and other factors that could cause our actual results, levels of activity, performance or achievement to differ materially from those expressed or implied by these forward-looking statements.

Forward-looking statements include all statements that are not historical facts. In some cases, you can identify forward-looking statements by terms such as “may,” “will,” “should,” “could,” “would,” “expects,” “plans,” “anticipates,” “believes,” “estimates,” “projects,” “predicts,” “potential,” or the negative of those terms, and similar expressions and comparable terminology intended to identify forward-looking statements. These statements reflect our current views with respect to future events and are based on assumptions and subject to risks and uncertainties, including those outlined in our Annual Report on Form 10-K for the year ended December 31, 2018. Given these uncertainties, you should not place undue reliance on these forward-looking statements. These forward-looking statements represent our estimates and assumptions only as of the date of this proxy statement and, except as required by law, we undertake no obligation to update or revise publicly any forward-looking statements, whether due to new information, future events or otherwise after the date of this proxy statement.

**PROPOSAL NO. 1: ELECTION OF DIRECTORS****General**

Our Amended and Restated Bylaws provide that the number of our directors is to be within a range of three to nine, with the exact number set by the Board. Our Board has set the number of directors at nine.

Our Board currently consists of nine directors. There are nine nominees for election to the Board this year. Each director to be elected and qualified will hold office until the next annual meeting of the stockholders and until his or her successor is duly elected and qualified, or, if sooner, until the director's death, resignation or removal. Each of the nominees listed below is currently a director. Each of the director nominees was previously elected by the stockholders. Directors are elected by a plurality of the votes of the holders of shares present in person or represented by proxy and entitled to vote on the election of directors. The nine nominees receiving the highest number of affirmative votes will be elected.

**Nominees for Director**

The Nominating and Governance Committee has recommended, and the Board has approved, the nomination of each of Anthony E. Altig, Mark Auerbach, Richard D. DiMarchi, Ph.D., Myron Z. Holubiak, Helen S. Kim, Alan J. Lewis, Ph.D., Susan Mahony, Ph.D., William R. Ringo, Jr. and Derek A. Small to serve as a director of our Company. The Board has determined that all of these directors, except for Mr. Small, are independent as determined in accordance with the rules of the Nasdaq Stock Market and the SEC. There are no family relationships among any of our directors or executive officers. The respective names, ages, lengths of service on our Board and brief biographical summaries of our nominees for director are as follows:

<u>Name</u>	<u>Age (as of 3/22/19)</u>	<u>Director Since</u>	<u>Business Experience</u>
Anthony E. Altig	63	2012	Mr. Altig joined our Board in January 2012. From 2008 to December 2017, Mr. Altig was the Chief Financial Officer of Biotix Holdings, Inc., a company that manufactures microbiological consumables, which was acquired by Mettler Toledo in September 2017. From 2004 to 2007, Mr. Altig served as the Chief Financial Officer of Diversa Corporation (subsequently Verenum Corporation), a public company developing specialized industrial enzymes. Prior to joining Diversa, Mr. Altig served as the Chief Financial Officer of Maxim Pharmaceuticals, Inc., a public biopharmaceutical company. In addition, Mr. Altig serves as a director and chairman of the audit committee for TearLab Corporation (formerly OccuLogix, Inc.), a publicly traded eyecare technology company. He formerly served as a director of MultiCell Technologies, Inc. and Optimer Pharmaceuticals, Inc., a pharmaceutical company, which was a public company until its acquisition by Cubist Pharmaceuticals, Inc. in October 2013. Mr. Altig received his B.B.A. in business from the University of Hawaii at Manoa and is a Certified Public Accountant (inactive). Among other experiences, qualifications, attributes and skills, Mr. Altig's extensive management experience and financial expertise, as well as his experience serving on the boards of directors of several public pharmaceutical and healthcare companies, led to the conclusion of our Board that he should serve as a director of the Company in light of our business and structure.

Name	Age (as of 3/22/19)	Director Since	Business Experience
Mark Auerbach	80	2010	<p>Mr. Auerbach joined our Board in November 2010. From April 2013 until June 2016, Mr. Auerbach was the chairman of the audit committee of RCS Capital Corporation (NYSE: RCAP), a publicly traded financial services company. From December 2014 until June 2016, Mr. Auerbach was non-executive chairman of the board of RCS Capital Corporation. Mr. Auerbach previously served as lead independent director and chairman of the audit committee of Optimer Pharmaceuticals, Inc., a public company, from 2005 until its acquisition by Cubist Pharmaceuticals, Inc. in October 2013. From January 2006 through March 2010, Mr. Auerbach served as the chairman of the board of directors for Neuro Hitech, Inc., an early stage pharmaceutical company specializing in brain degenerative diseases. Over the last 20 years, Mr. Auerbach also has served as a director for several other companies, including Par Pharmaceutical Companies, Inc., a publicly traded manufacturer and marketer of generic pharmaceuticals and the parent of Par Pharmaceutical, Inc. From 1993 to 2005, Mr. Auerbach served as chief financial officer of Central Lewmar LLC, a national fine paper distributor. Mr. Auerbach received his B.S. degree in accounting from Rider University. Among other experiences, qualifications, attributes and skills, Mr. Auerbach's extensive financial experience, his accounting degree and his experience as a director of several public companies, including his service as the chair of the audit committee of one of those public companies, led to the conclusion of our Board that he should serve as a director of the Company in light of our business and structure.</p>

Name	Age (as of 3/22/19)	Director Since	Business Experience
Richard D. DiMarchi, Ph.D.	66	2014	<p>Dr. DiMarchi joined our Board in July 2014 upon the closing of the Assembly Pharmaceuticals, Inc. acquisition through its merger with a wholly owned subsidiary of Assembly (the Merger). Dr. DiMarchi is a co-founder of Assembly Pharmaceuticals, Inc. and served on its board from its inception in 2012 through the Merger. Dr. DiMarchi is a Cox Distinguished Professor of Biochemistry and Gill Chair in Biomolecular Sciences at Indiana University (but currently on leave of absence until January 2020) and serves as Vice President of Research at Novo Nordisk Research Labs. Dr. DiMarchi was a co-founder and board member of biotechnology companies Ambrx, Inc. and Marcadia Biotech Inc. (until it was acquired by Roche in 2010). Dr. DiMarchi was a founder of Calibrium LLC, which was acquired by Novo Nordisk in 2015 and advisor to Twilight Ventures. Dr. DiMarchi retired as Group Vice President at Eli Lilly &amp; Company, where he provided leadership for more than two decades in biotechnology, endocrine research, and product development. Dr. DiMarchi previously served as a board member of the biotechnology trade group BIO, Ionis Pharmaceuticals, Inc. (f/k/a Isis Pharmaceuticals, Inc.) and Millennium BioTherapeutics, Inc. His current research is focused on developing macromolecules with enhanced therapeutic properties through biochemical and chemical optimization, an approach he has termed chemical biotechnology. Dr. DiMarchi contributed significantly to the discovery of Humalog<sup>®</sup> and to the commercial development of pharmaceutical products Humulin<sup>®</sup>, Humatrope<sup>®</sup>, Glucagon<sup>®</sup>, Xigris<sup>®</sup>, Forteo<sup>®</sup>, and Evista<sup>®</sup>. Dr. DiMarchi is the recipient of numerous prestigious awards and in 2014 was inducted to the National Inventors Hall of Fame and in 2015 to the National Academy of Medicine. Dr. DiMarchi received a B.S. with honors from Florida Atlantic University and his Ph.D. in Biochemistry from Indiana University, and completed his postdoctoral studies at the Rockefeller University. Among other experiences, qualifications, attributes and skills, Dr. DiMarchi's scientific training, extensive experience in the pharmaceutical industry, as well as his experience serving on the board of directors of several private pharmaceutical companies, led to the conclusion of our Board that he should serve as a director of the Company in light of our business and structure.</p>



<u>Name</u>	<u>Age (as of 3/22/19)</u>	<u>Director Since</u>	<u>Business Experience</u>
Myron Z. Holubiak	72	2010	<p>Mr. Holubiak joined our Board in July 2010. Since March 2016 Mr. Holubiak has served as President, Chief Executive Officer and a director of Citius Pharmaceuticals, Inc. (NASDAQ: CTXR), a late stage drug development company focused on critical care drug products. From September 2014 until March 2016, Mr. Holubiak was the founder and Chief Executive Officer and President of Leonard-Meron Biosciences, Inc., which merged with Citius Pharmaceuticals, Inc. in March 2016. Mr. Holubiak is the former President of Roche Laboratories, Inc., USA, a major research-based pharmaceutical company, a position he held from December 1998 to August 2001. Prior to that, he held many sales and marketing positions at Roche Laboratories during his 19-year tenure there. From September 2002 until June 2016, Mr. Holubiak served on the board of directors of BioScrip, Inc., a publicly traded company and a leading home infusion provider with nationwide pharmacy and nursing capabilities and was chairman of the board of Bioscrip, Inc. from April 2012 until June 2016. Mr. Holubiak was president of 1-800-DOCTORS, Inc., a private physician finder company, from May 2007 to January 2014 and a member of its board of directors until September 2017. Since July 2015, Mr. Holubiak also has been a member of the board of directors of bioAffinity Technologies, Inc., a private cancer screening and diagnostics company. From October 2012 until October 2014, Mr. Holubiak served as a director of Intellicell Biosciences, Inc., a publicly traded regenerative medicine company. From April 2013 to April 2015, Mr. Holubiak was also a trustee of the Academy of Managed Care Pharmacy Foundation. Mr. Holubiak received his B.S. in Molecular Biology and Biophysics from the University of Pittsburgh. Mr. Holubiak has received advanced business training from the Harvard Business School, the London School of Economics and the Centre for Health Economics at the University of York. Among other experiences, qualifications, attributes and skills, Mr. Holubiak's extensive experience managing pharmaceutical and healthcare companies led to the conclusion of our Board that he should serve as a director of the Company in light of our business and structure.</p>

Name	Age (as of 3/22/19)	Director Since	Business Experience
Helen S. Kim	56	2018	<p>Ms. Kim joined our Board in March 2018. Since March 2018, Ms. Kim has been a partner at The Column Group, a science-driven venture capital firm that invests in private companies. From November 2014 until January 2018, Ms. Kim served as executive vice president of business development at Kite Pharma, Inc. where she led all business and corporate development initiatives including its sale to Gilead in September 2017. From January 2012 to January 2014, Ms. Kim served as strategic advisor to NGM Biopharmaceuticals, Inc. and from August 2009 to January 2012, Ms. Kim served as chief business officer of NGM Biopharmaceuticals, Inc. Ms. Kim's additional industry experience includes executive positions at Kosan Biosciences, Affymax, Inc., Onyx Pharmaceuticals, Inc., Protein Design Labs, Inc. and Chiron Corporation. In addition to her industry experience, from August 2003 to November 2007, Ms. Kim served as chief program officer for the Gordon and Betty Moore Foundation. Currently, she serves as a director on the board of Exicure, Inc., a public company, and Applied Molecular Transport Inc. and Peloton Therapeutics, Inc. Ms. Kim formerly served as a director and member of the audit committee of Sunesis Pharmaceuticals, Inc. (NASDAQ: SNSS) and WCCT Global, Inc. and a director of Foresight Labs, VISION 4. Ms. Kim received a B.S. in Chemical and Biomedical Engineering from Northwestern University and an M.B.A. from the University of Chicago. Among other experiences, qualifications, attributes and skills, Ms. Kim's extensive experience in leadership roles in biotechnology companies led to the conclusion of our Board that she should serve as a director of the Company in light of our business and structure.</p>

Name	Age (as of 3/22/19)	Director Since	Business Experience
Alan J. Lewis, Ph.D.	73	2015	<p>Dr. Lewis joined our Board in December 2015. Since March 2015, Dr. Lewis has served as Chief Executive Officer and director of DiaVacs, Inc., a biotechnology company that offers dendritic cell therapy for autoimmunity and juvenile diabetes. From October 2012 to March 2014, Dr. Lewis was Chief Executive Officer and a director of Medistem, Inc., a publicly traded biotechnology company, and developer of stem cell therapies that was acquired by Intrexon Corporation. From July 2010 until November 2011, Dr. Lewis was Chairman, President and Chief Executive Officer of cancer drug developer Ambit Biosciences, Inc., which was subsequently acquired by Daiichi Sankyo Company, Limited. From January 2009 until June 2010, Dr. Lewis was President and Chief Executive Officer of the Juvenile Diabetes Research Foundation. From February 2006 until December 2008, Dr. Lewis was President and Chief Executive Officer of stem cell company Novocell, Inc., a privately held regenerative disease biotechnology company. Prior to that, Dr. Lewis served as Chief Executive Officer and a director of Signal Pharmaceuticals until its acquisition by Celgene Corporation. Dr. Lewis was named President of Celgene's Signal Research division in San Diego, where he directed its integrated drug discovery program in oncology and inflammation and served on Celgene's corporate executive committee. Dr. Lewis is on the board of directors for BioMarin Pharmaceuticals, Inc., where he chairs the science and technology committee and Scancell Holdings Plc, where he serves on the audit committee and remuneration committee. Dr. Lewis holds a B.Sc. in Physiology and Biochemistry from Southampton University and a Ph.D. in Pharmacology from the University of Wales, and he completed his postdoctoral training at Yale University. Among other experiences, qualifications, attributes and skills, Dr. Lewis' extensive experience in management and the operation of pharmaceutical and healthcare companies and his scientific background, together with his experience serving on the board of directors of a public company and several private biotechnology companies, led to the conclusion of our Board that he should serve as a director of the Company in light of our business and structure.</p>

Name	Age (as of 3/22/19)	Director Since	Business Experience
Susan Mahony, Ph.D.	54	2017	<p>Dr. Mahony joined our Board in December 2017. From 2011 until her retirement in August 2018, Dr. Mahony served as Senior Vice President and President of Lilly Oncology and was a member of the executive committee at Eli Lilly and Company (Lilly). Prior to that, from 2000 until 2011, Dr. Mahony served in a variety of leadership roles at Lilly, including Senior Vice President Human Resources and Diversity, President and General Manager Lilly Canada, and Executive Director Global Development. Dr. Mahony worked in sales and marketing at Bristol-Myers Squibb Company from 1995 to 2000, at Amgen Limited from 1991 to 1995, and at Schering Plough from 1989 to 1991. Dr. Mahony earned a B.Sc. and Ph.D. in pharmacy and was awarded an Honorary Doctorate from Aston University, and she earned an M.B.A. from London Business School. Because of these and other professional experiences, Dr. Mahony possesses particular knowledge and experience in all aspects of corporate functions and company operations that strengthen the Board's collective qualifications, skills and experience. Among other experiences, qualifications, attributes and skills, Dr. Mahony's extensive experience in management at public pharmaceutical companies led to the conclusion of our Board that she should serve as a director of the Company in light of our business and structure.</p>

Name	Age (as of 3/22/19)	Director Since	Business Experience
William R. Ringo, Jr.	73	2014	<p>Mr. Ringo became a director upon the closing of the Merger in July 2014 and became non-executive Chairman of the Board in February 2015. From July 2010 until December 2015, Mr. Ringo was a senior advisor with Barclays Capital, the global investment banking division of Barclays Bank PLC. From July 2010 until December 2015, Mr. Ringo served as a strategic advisor with Sofinnova Ventures, a life sciences-focused investment firm. Prior to his advisory roles with Barclays Capital and Sofinnova Ventures, Mr. Ringo served as Senior Vice President of Strategy and Business Development for Pfizer Inc., a biopharmaceutical company, from April 2008 until his retirement in April 2010. From 2004 to 2006, Mr. Ringo served as President and Chief Executive Officer of Abgenix, Inc., a biotechnology company acquired by Amgen, Inc. Mr. Ringo served on the Onyx Pharmaceuticals, Inc. board of directors from February 2011 until the October 2013 acquisition by Amgen, Inc. From 2001 to 2007, he served on various boards of directors, including: Encysive Pharmaceuticals, Inc.; Inspire Pharmaceuticals, Inc.; and InterMune, Inc., where he was the non-executive chairman of the board of directors after serving as interim Chief Executive Officer from June 2003 to September 2003. From 1994 to 2002, he served as a director and chairman of the board for Community Health Systems, Inc. His experience in the global pharmaceutical sector also includes nearly 30 years with Eli Lilly and Company (Lilly). Over the course of his career with Lilly, Mr. Ringo served in numerous executive roles, including Product Group President for oncology and critical care, President of internal medicine products, President of the infectious diseases business unit, and Vice President of sales and marketing for U.S. pharmaceuticals. He also was a member of Lilly's operating committee. Mr. Ringo is a director of Immune Design Corp., Dermira, Inc. and Five Prime Therapeutics, Inc. In the last five years, Mr. Ringo has also served as a director of Sangamo Biosciences, Inc. and Mirati Technologies, Inc. Mr. Ringo received a B.S. in business administration and an M.B.A. from the University of Dayton. Among other experience, qualifications, attributes and skills, Mr. Ringo's extensive management experience in the pharmaceutical industry and experience in the capital markets, as well as his experience serving on the boards of directors of public pharmaceutical companies and on the boards of directors of several private pharmaceutical companies, led to the conclusion of our Board that he should serve as a director of the Company in light of our business and structure.</p>

Name	Age (as of 3/22/19)	Director Since	Business Experience
Derek A. Small	43	2014	Mr. Small has served as our President and Chief Executive Officer since February 2015. Upon the closing of the Merger, Mr. Small joined us as a director and our President and Chief Operating Officer. Mr. Small co-founded Assembly Pharmaceuticals, Inc. and served as its Executive Chairman from its inception in 2012 and Chief Executive Officer beginning in January 2014. From March 2008 to January 2014, Mr. Small served as a founding director, President, and Chief Executive Officer of Naurex, Inc., a privately-held biotechnology company developing novel therapies for central nervous system (CNS) disorders whose clinical assets were acquired by Allergan Pharmaceuticals International Limited in 2014. At Naurex, Mr. Small spearheaded the development of a rapidly acting novel antidepressant drug, Rapastinel, which has since been granted “breakthrough” designation from the FDA. Naurex’s preclinical programs formed the basis for a spinout CNS company, Aptinyx, Inc. From January 2009 to April 2012, Mr. Small also served as a founding director, President, and Chief Executive Officer of Coferon, Inc., a privately-held biotechnology company, which is developing a novel self-assembling chemistry platform. Assembly Pharmaceuticals, Naurex/Aptinyx and Coferon are portfolio enterprises of Luson Bioventures, LLC, a biotechnology and biopharmaceutical venture creation firm that Mr. Small founded in 2007 and continues to head. Mr. Small received his B.S. in Business from Franklin College and studied global business at the Harlaxton College affiliate program in England. Among other experience, qualifications, attributes and skills, Mr. Small’s extensive management experience in the pharmaceutical industry, as well as his experience serving on the board of directors of several private pharmaceutical companies, led to the conclusion of our Board that he should serve as a director of the Company in light of our business and structure.

#### Required Vote

Assuming a quorum is present, the nine nominees receiving the highest number of “FOR” votes from the holders of shares present in person or represented by proxy at the Annual Meeting and entitled to vote on Proposal No. 1 shall be elected as directors to serve until the 2020 Annual Meeting of Stockholders or until their successors have been duly elected and qualified or, if sooner, until the director’s death, resignation or removal. Only votes “FOR” will affect the outcome. “WITHHOLD” votes and broker non-votes will have no effect on the outcome of the election of directors.

#### Recommendation of the Board of Directors

**THE BOARD OF DIRECTORS RECOMMENDS  
A VOTE “FOR” THE ELECTION OF EACH NAMED NOMINEE FOR DIRECTOR.**

## THE BOARD OF DIRECTORS AND CORPORATE GOVERNANCE

This section describes key corporate governance guidelines and practices that we have adopted. Complete copies of the charters of our committees of the Board and our Corporate Governance Guidelines, Code of Conduct and Code of Ethics described below may be found in the Investors section of our website [www.assemblybio.com](http://www.assemblybio.com). Alternatively, you can request a copy of any of these documents free of charge by writing to Elizabeth H. Lacy, General Counsel, Vice President of Legal Operations and Corporate Secretary, c/o Assembly Biosciences, Inc. 11711 N. Meridian Street, Suite 310, Carmel, Indiana 46032. Information on our website is not incorporated by reference into this proxy statement.

### Meetings of the Board

Our Company is under the general oversight of the Board as provided by the laws of Delaware and our Amended and Restated Bylaws. During the fiscal year ended December 31, 2018, the Board held six meetings and took action by unanimous written consent once. Each person who was a director during 2018 attended 75% or more of the aggregate meetings of the Board and meetings of all committees of the Board on which such director served during the year. Applicable Nasdaq listing standards require that independent directors meet regularly in executive session. In fiscal 2018, our independent directors met in regularly scheduled executive sessions at which only independent directors were present.

The Board adopted a formal policy that a Board meeting be held on the same date as the annual stockholders meeting and all directors of the Company are encouraged to attend our annual meetings of stockholders. All of our director nominees in 2018 attended last year's Annual Meeting.

### Board Composition

Our Nominating and Governance Committee aims to assemble a Board that brings to us a variety of perspectives and skills derived from high-quality business and professional experience. Directors should possess high personal and professional ethics, integrity and values and be committed to representing the best interests of our stockholders. The Board is composed of individuals that enhance the gender, age and ethnic diversity of the Board.

In fulfilling its responsibilities to select and recommend director nominees to serve on our Board, our Nominating and Governance Committee annually evaluates our incumbent Board members and other candidates, if any, against the following criteria in determining whether to recommend these directors for nomination:

- the appropriate size of our Board and its committees;
- the perceived needs of our Board for particular skills, background and business experience;
- the skills, background, reputation and depth and breadth of business experience of nominees;
- nominees' independence from management;
- diversity, including of experience, competency in relevant fields, gender, race, ethnicity and age; and
- applicable regulatory and listing requirements, including independence requirements and legal considerations.

Our Corporate Governance Guidelines provide that the Nominating and Governance Committee must be satisfied that each recommended nominee to the Board meets the following minimum qualifications:

- nominee shall have experience at a strategic or policymaking level in a business, government, non-profit or academic organization of high standing;
- nominee shall be highly accomplished in his or her respective field, with superior credentials and recognition;
- nominee shall be well regarded in the community and shall have a long-term reputation for high ethical and moral standards;

- nominee shall have sufficient time and availability to devote to the affairs of the Company, particularly in light of the number of boards of directors on which such nominee may serve; and
- to the extent such nominee serves or has previously served on other boards of directors, the nominee shall have a demonstrated history of actively contributing at board meetings.

Other than the foregoing, there are no stated minimum criteria for director nominees, although our Nominating and Governance Committee may also consider such other factors as it may deem, from time to time, to be in the best interests of the Company and our stockholders.

### **Independence of Directors**

Our Board applies the independence standards under the Nasdaq Stock Market Rules (the Nasdaq listing rules) to all of our directors, because our common stock is listed on the Nasdaq Global Select Market. Using the test provided in Rule 5605(a)(2) of the Nasdaq listing rules, the Board has determined that current directors Anthony E. Altig, Mark Auerbach, Richard D. DiMarchi, Ph.D., Myron Z. Holubiak, Helen S. Kim, Alan J. Lewis, Ph.D., Susan Mahony, Ph.D. and William R. Ringo, Jr. are independent. Derek A. Small is not independent because he is our current President and Chief Executive Officer. As part of such determination of independence, our Board considered the relationships that each non-employee director has with us and all other facts and circumstances that the Board deemed relevant in determining independence, including the beneficial ownership of our capital stock by each non-employee director and the association of certain of our directors with third parties, including Indiana University, from whom we license certain intellectual property. After considering these factors, our Board has affirmatively determined that each of Mr. Altig, Mr. Auerbach, Dr. DiMarchi, Mr. Holubiak, Ms. Kim, Dr. Lewis, Dr. Mahony and Mr. Ringo does not have a relationship with us that would interfere with the exercise of independent judgment in carrying out his or her responsibilities as a director.

### **Board Leadership Structure**

Our Board does not have a specific policy regarding the separation of the roles of the Chairman of the Board and the Chief Executive Officer and believes it is in the best interest of our Company and our stockholders to be able to exercise discretion in combining or separating these positions as we deem appropriate in light of prevailing circumstances. The roles are currently separated, with Mr. Ringo serving as independent Chairman. The Board believes that this structure best serves the interests of our stockholders because it allows our Chief Executive Officer to focus primarily on our business strategy and operations and most effectively leverages the experience of the Chairman. It also enhances the Board's independent oversight of our senior management team and enables better communications and relations between the Board, the Chief Executive Officer and other members of our senior management team. In that regard, our independent Chairman presides over Board meetings and the executive sessions of the non-management and independent directors of the Board. Our approach provides flexibility to allow our Board to modify our leadership structure in the future as appropriate. We believe that we, like many U.S. companies, are well served by this flexible leadership structure.

### **Risk Oversight**

The Board is actively involved in the oversight of risks that could affect us. This oversight is conducted primarily through committees of the Board, particularly the Audit Committee, the Compensation Committee and the Nominating and Governance Committee, but the full Board has retained responsibility for general oversight of risks. The Board satisfies this responsibility through regular reports by each committee chair regarding the committee's considerations and actions, as well as through regular reports directly from officers responsible for oversight of particular risks.

### **Board Committees**

The Board has four standing committees. Each committee operates under a charter that has been adopted by the Board, which can be found in the Corporate Governance section of the Investors section of our website at [www.assemblybio.com](http://www.assemblybio.com). Information on our website is not incorporated by reference into this proxy statement. Each of the committees has authority to engage legal counsel or other experts or



consultants as it deems appropriate to carry out its responsibilities. The table below sets forth the current membership of each of the standing committees and the number of meetings each committee held in 2018, excluding actions taken by unanimous written consent. Each director attended 75% or more of the aggregate meetings of the Board and all meetings of the committees on which he or she served during the period for which he or she was a director or committee member, as applicable, in 2018. The table also sets forth the independence of each director. For purposes of the table, “independent” means the director is (1) independent under the Nasdaq listing rules, (2) a “non-employee director” as defined in Rule 16b-3 of the Securities Exchange Act of 1934, as amended (the Exchange Act) and (3) an “outside director” as that term is defined for purposes of Section 162(m) of the Internal Revenue Code of 1986, as amended (the Code).

	Independent	Audit Committee	Compensation Committee	Nominating and Governance Committee	Science and Technology Committee
Number of Meetings in 2018		6	9	4	3
Anthony E. Altig <sup>+</sup>	✓	✓		✓	
Mark Auerbach <sup>+</sup>	✓	✓ <sup>**</sup>	✓		
Richard D. DiMarchi, Ph.D.	✓				✓ <sup>**</sup>
Myron Z. Holubiak	✓		✓ <sup>**</sup>	✓	
Helen S. Kim <sup>††</sup>	✓				✓
Alan J. Lewis, Ph.D.	✓			✓ <sup>**</sup>	✓
Susan Mahony, Ph.D.	✓		✓ <sup>†</sup>		✓
William R. Ringo, Jr. <sup>*</sup>	✓	✓	✓		
Derek A. Small					

\* Chairman of the Board

\*\* Committee Chair

+ “Audit Committee Financial Expert” as defined in Item 407(d) of Regulation S-K

† Dr. Mahony was appointed to the Compensation Committee on May 30, 2018

†† Ms. Kim was appointed to the Board and the Science and Technology Committee on March 8, 2018

#### Audit Committee

The Audit Committee was established in accordance with Section 3(a)(58)(A) of the Exchange Act by the Board to oversee and appraise our accounting and financial reporting processes, the audit process, our process for monitoring compliance with laws, regulations and our codes of conduct and ethics, and the quality and integrity of our financial statements and reports. In addition, the Audit Committee oversees the qualification, selection, independence and performance of our independent registered public accounting firm and recommends to the Board the appointment of our independent registered public accounting firm. Additionally, our Audit Committee is responsible for reviewing and approving all related person transactions, including transactions with executive officers and directors, for potential conflicts of interests or other improprieties.

At the direction of the Nominating and Governance Committee, the Audit Committee conducts an annual performance evaluation of the Audit Committee and reports to the Board on the results of such evaluation.

The charter for our Audit Committee requires that the Audit Committee have at least three independent directors. Our Audit Committee consists of Mr. Auerbach (Chair), Mr. Altig and Mr. Ringo. The Board annually reviews the Nasdaq listing rules’ definition of independence for Audit Committee members and has determined that Messrs. Auerbach, Altig and Ringo are each independent (as independence is currently defined in Nasdaq listing rules 5605(a)(2) and within the meaning of 10A-3(b)(1) of the Exchange Act). The Board has determined that Messrs. Altig and Auerbach each qualify as an “audit committee financial expert” as that term is defined in Item 407(d) of Regulation S-K promulgated by the

SEC. In making that determination, the Board relied on the past business experience of Mr. Altig and Mr. Auerbach. The Board made a qualitative assessment of Mr. Altig’s level of knowledge and experience based on a number of factors, including his experience as the chief financial officer of several public companies and having been a certified public accountant. The Board made a qualitative assessment of Mr. Auerbach’s level of knowledge and experience based on a number of factors, including his extensive financial experience, his experience as a chief financial officer, his accounting degree and his experience as a director of several public companies, including his service as the chair of the audit committee of one of those public companies. For additional information, see the descriptions of the business experience for Mr. Altig and Mr. Auerbach under the heading “Proposal No. 1: Election of Directors — Nominees for Director.”

#### *Compensation Committee*

The charter for our Compensation Committee requires the committee to have not less than three members. Our Compensation Committee currently consists of Mr. Holubiak (Chair), Mr. Auerbach, Dr. Mahony and Mr. Ringo. Our Board has determined that Messrs. Holubiak, Auerbach and Ringo and Dr. Mahony are each independent under the Nasdaq listing rules, each is a “non-employee director” as defined in Rule 16b-3 promulgated under the Exchange Act and each is an “outside director” as that term is defined for purposes of Section 162(m) of the Code.

The purpose of our Compensation Committee is to discharge our Board’s responsibilities relating to compensation of our directors, executive officers and employees and to administer our equity compensation and other benefit plans. In carrying out these responsibilities, our Compensation Committee reviews all components of executive officer compensation for consistency with our Compensation Committee’s primary objectives of attracting and retaining key management personnel, driving long-term strategic values and enhancing stockholder value. The Compensation Committee charter specifies that the Compensation Committee will, among other things:

- review the recommendations of management with respect to our annual corporate goals and objectives and advise the Board regarding such annual corporate goals and objectives;
- taking into consideration the Board-approved corporate goals and objectives, review and approve the annual goals and objectives of our principal executive officer and other executive officers;
- evaluate the principal executive officer’s and the other executive officers’ performance in light of approved goals and objectives;
- determine and approve the compensation levels and other terms of employment of the principal executive officer and other executive officers based on this evaluation, including with respect to each executive officer, his or her base salary, cash and equity-based compensation, annual performance-based cash bonus, special benefits, perquisites and incidental benefits and other incentive compensation, benefits and terms of employment;
- review and approve the compensation of our other employees that the Committee may specify from time to time, and delegate authority to specified executive officer(s) to review and approve the compensation of other non-executive officer employees;
- review and approve any employment agreements, severance plans (including any benefits to be provided in connection with a change in control) and any other compensatory agreements, for the principal executive officer and other executive officers, including adopting, amending and terminating such agreements, plans or arrangements;
- review with the principal executive officer and any other appropriate officers the material criteria used by the principal executive officer and management in evaluating employee performance throughout the Company and in establishing appropriate compensation, retention, incentive, severance and benefit policies and programs;
- review and recommend changes to the compensation of our directors;

- oversee the administration of, and periodically review and make changes to, our incentive compensation plans, equity-based compensation plans, and any material employee benefit, bonus, retirement, severance and other compensation plans;
- prepare the Compensation Committee report and recommend the inclusion of the report in our proxy statement or Annual Report on Form 10-K as required;
- retain and approve the compensation of any compensation consultants; and
- evaluate the independence of any such compensation consultants.

Under the Compensation Committee charter, the Compensation Committee may, in its discretion, delegate its duties to a subcommittee consisting of one or more of its members and delegate authority to specified executive officers to review and approve the compensation of non-executive officer employees. At the direction of the Nominating and Governance Committee, the Compensation Committee shall perform an annual performance evaluation and report to the Board on its results.

The charter of the Compensation Committee grants the Compensation Committee full access to all of our books, records, facilities and personnel, as well as authority to obtain, at our expense, advice and assistance from compensation consulting firms, legal counsel and other advisors as it deems appropriate to assist it in the evaluation of the compensation of directors, the principal executive officer or the other executive and non-executive officers of the Company, and the fulfillment of its other duties.

#### *Nominating and Governance Committee*

The charter for the Nominating and Governance Committee requires the committee to consist of not less than two directors. Our Nominating and Governance Committee currently consists of three directors, Dr. Lewis (Chair), Mr. Altig and Mr. Holubiak. The Board has determined that each of Dr. Lewis, Mr. Altig and Mr. Holubiak are independent under the Nasdaq listing rules.

The primary purpose of our Nominating and Governance Committee is to select, and recommend to our Board, director nominees for each election of directors and recommend any corporate governance guidelines it deems appropriate. Additionally, the Committee has general oversight of our compliance with legal and regulatory requirements of our business operations, other than compliance with securities laws and regulations, including our financial reporting and disclosure obligations, or anti-bribery laws, which in each case shall be the responsibility of the Audit Committee.

The Nominating and Governance Committee will review and assess the adequacy of its charter at least once annually and recommend changes to the Board for approval.

Candidates for nomination as director may come to the attention of our Nominating and Governance Committee from time to time through incumbent directors, management, stockholders or third parties. Our Amended and Restated Bylaws contain provisions for stockholders to recommend persons for nomination as a director and, subject to certain conditions, to nominate director candidates for inclusion in our proxy statement, as set forth in this proxy statement under “Deadline for Stockholder Proposals for 2020 Annual Meeting of Stockholders.” Candidates for potential nomination may be considered at meetings of our Nominating and Governance Committee at any point during the year. Such candidates will be evaluated against the criteria set forth above, and the Nominating and Governance Committee’s policy will be to evaluate any recommendation for director nominees proposed by stockholders using the same criteria. If our Nominating and Governance Committee believes at any time that it is desirable that our Board consider additional candidates for nomination, the Committee may poll directors and management for suggestions or conduct research to identify possible candidates and may, if our Nominating and Governance Committee believes it is appropriate, engage a third-party search firm to assist in identifying qualified candidates.

Once director candidates are identified, the Nominating and Governance Committee conducts a review and evaluation of the qualifications of any proposed director candidate as it deems appropriate. There is no difference in the evaluation process of a candidate recommended by a stockholder as compared to the evaluation process of a candidate identified by any of the other means described above.

If the Nominating and Governance Committee determines that a candidate should be nominated for election to the Board, the candidate's nomination is then recommended to the Board, and the directors may in turn conduct their own review to the extent they deem appropriate. When the Board has agreed upon a candidate, such candidate is recommended to the stockholders for election at an annual meeting of stockholders or appointed as a director by a vote of the Board as appropriate.

All of the current directors have been recommended by the Nominating and Governance Committee to the Board for re-election as our directors at the Annual Meeting, and the Board has approved such recommendations.

#### *Science and Technology Committee*

Our Science and Technology Committee consists of Dr. DiMarchi (Chair), Ms. Kim, Dr. Lewis and Dr. Mahony. The primary purpose of our Science and Technology Committee is to assist the Board with oversight of our research and development activities, including to advise the Board with respect to strategic and tactical scientific matters. In furtherance of its purpose, the Science and Technology Committee reviews, among other things:

- our overall scientific and research and development strategy;
- our research and development programs;
- our regulatory compliance/quality programs, as applicable;
- related external scientific research, discoveries and commercial developments, as appropriate;
- our overall intellectual property strategies and our portfolio of patents;
- management's decisions regarding the allocation, deployment, utilization of and investment in our scientific assets; and
- management's decisions regarding acquiring or divesting scientific technology or otherwise investing in research or development programs.

The Science and Technology Committee charter requires that the Science and Technology Committee meet at least twice per year. The Chair of the Science and Technology Committee, in consultation with the other members and management, may set meeting agendas. The Science and Technology Committee will review and assess the adequacy of its charter at least once annually and recommend changes to the Board for approval.

#### **Code of Ethics**

Our Board has adopted a Code of Ethics for our principal executive officer and all senior financial officers and a Code of Conduct applicable to all of our employees and our directors. Both codes can be found in the Corporate Governance section of the Investors section of our website at [www.assemblybio.com](http://www.assemblybio.com). If we make any substantive amendments to, or grant any waivers from, the Code of Ethics for our principal executive officer, principal financial officer, principal accounting officer, controller or persons performing similar functions, or any officer or director, we will disclose the nature of such amendment or waiver on our website or in a Current Report on Form 8-K.

#### **Director Compensation**

Our directors play a critical role in guiding our strategic direction and overseeing the management of our Company. The many responsibilities and risks and the substantial time commitment of being a director require that we provide adequate compensation commensurate with our directors' workload and opportunity costs. Non-employee directors receive a combination of annual cash retainers and equity awards in amounts that correlate to their responsibilities and levels of Board participation, including service on Board committees. Our only employee director, Mr. Small, receives no separate compensation for his service as a director.

The following table sets forth the annualized cash compensation payable to our non-employee directors in 2018.

Director Position	Annual Cash Compensation <sup>(1)</sup>
All Non-Employee Directors	\$37,917 <sup>(2)</sup>
Chair of the Board	\$30,000
Audit Committee Chair	\$15,000
Service on Audit Committee (other than as Chair)	\$ 7,500
Chair of Nominating & Governance, Compensation or Science and Technology Committees	\$10,000
Service on Nominating & Governance, Compensation or Science and Technology Committees (other than as Chair)	\$ 5,000

- (1) The annual cash compensation that we pay to Board members, other than Mr. Small is based on their positions on the Board or the committees of the Board, and we do not compensate the Board members on a per meeting basis. The amounts reflected in the table above were in effect for 2018 unless otherwise noted.
- (2) From January 1, 2018 through May 31, 2018, the cash compensation paid to non-employee directors for service on the Board was paid at an annualized rate of \$35,000. Effective June 1, 2018, the cash compensation paid to non-employee directors for service on the Board was increased to an annualized rate of \$40,000.

Effective April 1, 2019, the cash compensation (1) for the Chair of the Board was increased from an annualized rate of \$30,000 to \$40,000, (2) for the Chair of the Audit Committee was increased from an annualized rate of \$15,000 to \$20,000 and for members of the Audit Committee was increased from an annualized rate of \$7,500 to \$10,000, (3) for the Chair of the Compensation Committee was increased from an annualized rate of \$10,000 to an annualized rate of \$15,000 and (4) for members of the Compensation Committee was increased from an annualized rate of \$5,000 to an annualized rate of \$7,500. No change was made to the cash compensation for the Chair and members of the Nominating and Governance Committee or the Science and Technology Committee.

Upon joining the Board, each new non-employee director is granted an option to purchase 20,000 shares of our common stock, which vests over three years in three approximately equal installments on each anniversary of the date of grant. Each year, on the date of our annual meeting of stockholders, each non-employee director that is elected will be entitled to receive a grant of an equity award, which will vest in full upon the earlier of the first anniversary of the grant date and the next annual meeting of stockholders. The exercise price per share of equity awards that constitute options is the fair market value of a share of our common stock on the date of the grant of the option. All options have a term of ten years. In 2018, non-employee individuals elected to serve on the Board of Directors at the 2018 Annual Stockholders meeting were granted an option to purchase 7,500 shares of common stock. Subject to the limitations of the 2018 Stock Incentive Plan, non-employee individuals elected to serve on the Board of Directors at the 2019 Annual Stockholders meeting will be granted an option to purchase 10,000 shares of common stock.

The following table sets forth information regarding cash and non-cash compensation earned by or paid to each of our non-employee directors serving as directors during 2018.

Name	Fees Earned or Paid in Cash (\$) <sup>(1)</sup>	Option Awards (\$) <sup>(2)(3)</sup>	Total (\$)
Anthony E. Altig	50,417	210,648	261,065
Mark Auerbach	57,917	210,648	268,565
Richard D. DiMarchi, Ph.D.	47,917	210,648	258,565
Myron Z. Holubiak	52,917	210,648	263,565
Helen S. Kim <sup>(4)</sup>	35,583	1,024,616	1,060,199
Alan J. Lewis, Ph.D.	52,917	210,648	263,565
Susan Mahony, Ph.D. <sup>(5)</sup>	45,833	210,648	256,481
William R. Ringo, Jr.	80,417	210,648	291,065

- (1) On June 1, 2018 the annual retainer for non-employee directors was increased from \$35,000 to \$40,000.
- (2) As of December 31, 2018, our non-employee directors held the following unexercised options to purchase shares of our common stock: Mr. Altig, 99,000 shares; Mr. Auerbach, 99,000 shares; Dr. DiMarchi, 99,000 shares; Mr. Holubiak, 99,000 shares; Ms. Kim, 27,500 shares; Dr. Lewis, 55,000 shares; Dr. Mahony, 27,500 shares; and Mr. Ringo, 84,000 shares. Our non-employee directors did not hold any other equity awards as of such date.
- (3) The reported amounts in the table above represent the aggregate grant date fair value of the options granted in 2018 computed in accordance with Financial Accounting Standards Boards (FASB) Accounting Standards Codification (ASC) Topic 718. Assumptions used in the calculation of these amounts are included in Note 7 of the consolidated financial statements included in our Annual Report on Form 10-K for the year ended December 31, 2018.
- (4) Fees earned or paid in cash represents payments of Ms. Kim's prorated annual retainer (\$31,500) and prorated committee retainer for service on the Science and Technology Committee (\$4,083). Option awards include Ms. Kim's (a) initial grant of an option to purchase 20,000 shares of our common stock upon joining the Board, and (b) annual grant of an option to purchase 7,500 shares of our common stock as granted to all non-employee directors elected to serve at the 2018 Annual Meeting.
- (5) Dr. Mahony was appointed to the Compensation Committee on May 29, 2018. Fees earned or paid in cash represents payments of Dr. Mahony's annual retainer for service on the Board and the Science and Technology Committee and prorated committee retainer for service on the Compensation Committee (\$2,917).

### Stockholder Communications

Stockholders and other interested parties may communicate with the Board by writing to Derek A. Small, our President and Chief Executive Officer, at Assembly Biosciences, Inc., 11711 N. Meridian Street, Suite 310, Carmel, Indiana 46032. Mr. Small received no such communications in 2018. Upon receipt of a stockholder communication indicating a desire to communicate with the Board, Mr. Small will review the communication and determine whether the communication should be directed to the Board or any individual director. All communications will be forwarded in this manner; provided, however, that Mr. Small reserves the right not to forward to the Board or any individual director any materials that he deems in his reasonable discretion to be unduly frivolous, hostile, threatening or similarly inappropriate for communication to the Board or any individual director.

### **Stockholder Engagement**

Senior management regularly engages with our stockholders at industry conferences and investor meetings. In response to feedback gained through our engagement program, we remain focused on delivering on our growth strategy, and we continue to enhance the transparency and disclosure of our financial, operational and environmental and governance performance.

Our investor relations team keeps the Board regularly updated on the views of stockholders and provides reports from financial and other advisers concerning institutional stockholder feedback.

In December 2018, we received a letter from a stockholder requesting that we reorganize the Board into one class with each director subject to election each year and to complete this transition within one year. As our Amended and Restated Bylaws already provided for one class of directors and the election of each director annually, after direct engagement with the stockholder regarding the proposal, the stockholder withdrew the proposal.

**PROPOSAL NO. 2: ADVISORY VOTE TO APPROVE OUR NAMED EXECUTIVE OFFICERS' COMPENSATION**

**General**

Under the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (the Dodd-Frank Act) and Section 14A of the Exchange Act, our stockholders are entitled to vote to approve, on a non-binding advisory basis, the compensation of our named executive officers (Named Executive Officers or NEOs) as disclosed in this proxy statement in accordance with the SEC's rules. This vote is commonly known as the "Say on Pay" vote. This vote is not intended to address any specific item of compensation, but rather our NEOs' overall compensation and the philosophy, policies and practices described in this proxy statement.

We provide our stockholders with the opportunity to cast an advisory vote on our NEOs' compensation every year. Approximately 93% of the votes cast on our "Say on Pay" vote were voted in favor of the proposal in 2018.

Our NEOs' compensation subject to this vote is disclosed in the sections "Executive Compensation," "Compensation Discussion and Analysis" and the compensation tables and the related narrative disclosure contained in this proxy statement. As discussed in these disclosures, we believe that our compensation philosophy is to provide competitive overall compensation that attracts and retains top performers. To achieve these goals, our compensation program is structured to:

- provide total compensation, compensation elements and other benefits that are competitive with those companies that are competing for available employees;
- provide a mix of compensation that offers (1) a market-competitive base salary, with targeted annual performance-based cash bonus opportunities based on individual achievement and Company performance against corporate goals, generally measured over a 12-month performance period, and (2) the opportunity to share in the long-term growth of our Company through equity compensation; and
- reward exceptional performance by individual employees.

Accordingly, the Board is asking the stockholders to indicate their support for the compensation of our NEOs as described in this proxy statement by casting a non-binding advisory vote "FOR" the following resolution:

"RESOLVED, that the Company's stockholders hereby approve, on an advisory basis, the compensation of the Company's named executive officers, as disclosed in the proxy statement for the 2019 Annual Meeting of Stockholders pursuant to the compensation disclosure rules of the Securities and Exchange Commission, including the Compensation Discussion and Analysis, the compensation tables and narrative discussion in the proxy statement for the 2019 Annual Meeting of Stockholders."

The "Executive Compensation" section of this proxy statement contains more details on our NEOs' compensation, and we urge you to read it carefully before casting your vote on this proposal. Because the vote is advisory, it is not binding on us, the Board or the Compensation Committee of the Board. Nevertheless, the views expressed by the stockholders, whether through this vote or otherwise, are important to our management, the Board and the Compensation Committee. Our management, the Board and Compensation Committee intend to consider the results of this vote in making recommendations and determinations in the future regarding executive compensation arrangements and our executive compensation principles, policies and procedures.

We submit the compensation of our NEOs to our stockholders for an advisory vote on an annual basis. Accordingly, the next stockholder advisory vote on the compensation of our NEOs after the Annual Meeting is expected to take place at the 2020 Annual Meeting of Stockholders.



**Required Vote**

Assuming a quorum is present, to be approved, a majority of the shares of common stock held by holders present in person or represented by proxy at the Annual Meeting and entitled to vote on Proposal No. 2 must be voted “FOR” the approval, on a non-binding advisory basis, of our NEOs’ compensation. Abstentions will be deemed a vote against Proposal No. 2. Broker non-votes will not be considered towards vote totals on Proposal No. 2 and will have no effect on the outcome of the vote.

**Recommendation of the Board of Directors**

**THE BOARD OF DIRECTORS RECOMMENDS A VOTE “FOR” THE APPROVAL, ON A NON-BINDING ADVISORY BASIS, OF OUR NAMED EXECUTIVE OFFICERS’ COMPENSATION.**

## MATTERS RELATING TO OUR INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

### Pre-Approval Policies and Procedures

The charter of the Audit Committee provides that the Audit Committee shall pre-approve all auditing services and the terms thereof (which may include providing comfort letters in connection with underwritten securities offerings) and non-audit services (other than non-audit services prohibited under Section 10A(g) of the Exchange Act or the applicable rules of the SEC or the Public Company Accounting Oversight Board) to be provided to us by the independent registered public accounting firm. The pre-approval requirement is waived with respect to the provision of non-audit services for us if the “de minimis” provisions of Section 10A(i)(1)(B) of the Exchange Act are satisfied. This authority to pre-approve non-audit services may be delegated to one or more members of the Audit Committee, who shall present all decisions to pre-approve an activity to the full Audit Committee at its first meeting following such decision. The Audit Committee pre-approved all services provided by Ernst & Young LLP, our independent registered public accounting firm for the fiscal years ended December 31, 2018 and 2017.

### Fees and Services

The following table represents aggregate fees billed to us for services related to the fiscal years ended December 31, 2018 and 2017 by Ernst & Young LLP, our independent registered public accounting firm:

Fees	2018	2017
Audit Fees <sup>(1)</sup>	\$809,895	\$499,000
Audit-Related Fees	—	—
Tax Fees <sup>(2)</sup>	131,072	128,947
All Other Fees <sup>(3)</sup>	25,000	3,000
Total	\$965,967	\$630,947

- (1) Audit Fees consisted of fees and expenses covering the integrated audit of our consolidated financial statements and of our internal control over financial reporting and review of the interim condensed consolidated financial statements, statutory audits, accounting and financial reporting consultations, and the issuance of consent and comfort letters in connection with registration statement filings with the SEC.
- (2) Tax Fees consist of fees and expenses for corporate tax compliance, routine on-call tax services, international tax advisory services, indirect (non-income) tax advisory and tax incentives, domestic tax advisory services.
- (3) All Other Fees consist of fees billed in the indicated year for an annual subscription to Ernst & Young LLP’s online resource library and for a cyber security risk assessment in 2018.

All of the services described above were pre-approved by our Audit Committee. The Audit Committee concluded that the provision of these services by Ernst & Young LLP would not affect their independence.

### Report of the Audit Committee of the Board of Directors

The Audit Committee reviews our financial reporting process on behalf of the Board. Management has the primary responsibility for the preparation and integrity of the consolidated financial statements and the reporting process, including establishing and monitoring the system of internal financial controls. In this context, the Audit Committee hereby reports as follows:

- The Audit Committee has reviewed and discussed our audited consolidated financial statements for the year ended December 31, 2018 with management.
- The Audit Committee has discussed with Ernst & Young LLP, our independent registered public accounting firm, the matters required to be discussed by Auditing Standard No. 1301, *Communications with Audit Committees*, as adopted by the Public Company Accounting Oversight Board (PCAOB).

3. The Audit Committee has received the written disclosures and the letter from Ernst & Young LLP required by applicable requirements of the PCAOB regarding the independent accountants' communications with the Audit Committee concerning independence and has discussed with Ernst & Young LLP its independence.
4. Based on the review and discussions described above, among other things, the Audit Committee has recommended to the Board that the audited consolidated financial statements be included in our Annual Report on Form -K for fiscal year ended December 31, 2018.

Submitted by:       The Audit Committee  
                          Mark Auerbach, Chairman  
                          Anthony E. Altig  
                          William R. Ringo, Jr.

**PROPOSAL NO. 3: RATIFICATION OF THE SELECTION OF THE  
INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM**

**General**

The Board has selected Ernst & Young LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2019 and has further directed that management submit the selection of the independent registered public accounting firm for ratification by the stockholders at the Annual Meeting. Ernst & Young LLP has served as our independent registered public accounting firm since 2015.

Neither our Amended and Restated Bylaws nor other governing documents or law require stockholder ratification of the selection of Ernst & Young LLP as our independent registered public accounting firm. However, the Board is submitting the selection of Ernst & Young LLP to the stockholders for ratification as a matter of good corporate practice. If the stockholders fail to ratify the selection, the Board will reconsider whether or not to retain Ernst & Young LLP. Even if the selection is ratified, the Board, in its discretion, may direct the appointment of different independent registered public accounting firm at any time during the year if the Board determines that such a change would be in the best interest of the Company and its stockholders. Representatives of Ernst & Young LLP are expected to be present at the Annual Meeting, where they will have an opportunity to make a statement and be available to respond to appropriate questions.

**Required Vote**

Assuming a quorum is present, to be approved, a majority of the shares of common stock held by holders present in person or represented by proxy at the Annual Meeting and entitled to vote on Proposal No. 3 must be voted "FOR" the ratification of the selection of Ernst & Young LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2019. Abstentions will be deemed a vote against Proposal No. 3. Broker non-votes will not be considered towards vote totals on Proposal No. 3; however, the ratification of the selection of Ernst & Young LLP is a matter on which a broker, bank or other nominee has discretionary voting authority, so we do not expect any broker non-votes with respect to Proposal No. 3.

**Recommendation of the Board of Directors**

**THE BOARD OF DIRECTORS RECOMMENDS A VOTE "FOR" THE RATIFICATION OF THE  
SELECTION OF ERNST & YOUNG LLP AS OUR INDEPENDENT REGISTERED PUBLIC  
ACCOUNTING FIRM.**

**PROPOSAL NO. 4: APPROVAL OF AN AMENDMENT TO THE  
ASSEMBLY BIOSCIENCES, INC. 2018 STOCK INCENTIVE PLAN**

**Background**

On April 5, 2018, subject to stockholders' approval, the Board adopted the Assembly Biosciences, Inc. 2018 Stock Incentive Plan (the 2018 Plan), which was approved by our stockholders on May 30, 2018. The 2018 Plan provides for the grant of equity awards to our employees, non-employee directors and consultants and is necessary to ensure that we can continue to grant equity awards to eligible recipients at levels determined to be appropriate by the Board, the Compensation Committee and/or the Chief Executive Officer pursuant to his Board delegated authority.

As of March 22, 2019, there were stock options to acquire 4,679,740 shares of common stock outstanding under our equity compensation plans and 15,000 cash settled stock appreciation rights. In addition, there were 377,316 shares subject to unvested restricted stock units (RSUs) with time-based vesting, 111,667 shares subject to vested RSUs that have not settled and 45,000 shares subject to unvested RSUs with performance-based vesting outstanding under our equity compensation plans. As of March 22, 2019, there were approximately 1,688,745 shares of common stock available and unallocated under our equity compensation plans, of which 262,178 shares are only issuable as inducement awards to new employees under our 2017 Inducement Award Plan (the 2017 Plan). On March 29, 2019, we issued annual grants to our employees totaling an aggregate of options to acquire 431,850 shares of common stock, 215,928 shares subject to unvested RSUs awards with time-based vesting and stock appreciation rights relating to 19,800 shares. As a result, as of the date of this Proxy Statement, there are approximately 641,523 shares of common stock remaining available and unallocated for issuance under the 2018 Plan.

On March 8, 2019, the Board, upon the recommendation of the Compensation Committee and subject to the approval of our stockholders at the Annual Meeting, approved Amendment No. 1 to the 2018 Plan (the Amendment) to, among other things, increase the number of shares reserved under the 2018 Plan from 1,900,000 to 3,000,000 (as amended, the Amended Plan). The proposed increase of 1,100,000 shares equals approximately 4.3% of the Company's outstanding shares.

**Purpose**

The purpose of the Amended Plan is to encourage ownership in the Company by our employees, directors and consultants and our affiliates whose long-term employment by or involvement with us is considered essential to our continued progress. This aligns the interests of the award recipients and stockholders and permits the award recipients to share in our success. The Amended Plan provides an essential component of the total compensation package offered to our employees and other 2018 Plan participants. It reflects the importance that we place on motivating employees and other 2018 Plan participants to achieve superior results over the long-term and paying employees and other 2018 Plan participants based on that kind of achievement. We strongly believe that our equity compensation programs and emphasis on employee and non-employee director stock ownership have been integral to our progress and that a continuation of and emphasis on those programs is necessary for us to achieve superior performance in the future. All of our, and our affiliates', employees, directors and our consultants are eligible to participate in the Amended Plan.

The purpose of the Amendment is to increase the number of shares reserved for issuance under the 2018 Plan by 1,100,000 shares and to eliminate the recycling of shares subject to awards under the 2014 Plan that are forfeited or repurchased into the Amended Plan. Such forfeited or repurchased awards would remain available under the 2014 Plan as provided in the 2014 Plan. We believe the ability to grant competitive equity awards is a necessary and powerful retention tool for us to obtain the quality and number of personnel we need to continue the forward momentum of our business resulting from continued advancement of our lead product candidate in our HBV-cure program into Phase 2 clinical studies, the initiation of Phase 1a/1b clinical studies for our HBV-cure program's second product candidate and the commencement of Investigational New Drug (IND) enabling studies for our HBV-cure program's third product candidate, as well as the advancement of our Microbiome program's lead product candidate into Phase 1b clinical studies and continued nonclinical studies related to other indications. We believe this

request is modest yet sufficient to meet our retention and anticipated new hire needs until the next annual meeting of stockholders and will underpin one of our core compensation philosophies, namely to pay for performance, by giving our employees and other 2018 Plan participants the opportunity to share in our long-term growth through equity compensation.

### Rationale

We believe you should vote to approve the Amendment for the following reasons:

- *We are committed to sound equity compensation practices.* We recognize that equity compensation awards dilute stockholder equity and so must be used judiciously. Although our employee headcount is rapidly increasing as our business grows, we have generally aligned our compensation practices with industry norms among our peer group described in this proxy statement under “Executive Compensation — Compensation Discussion and Analysis — Independent Compensation Consultant — Compensation Adjustments and Peer Group Process.” We believe our use of equity has been responsible and mindful of stockholder interests.
- *The Amended Plan contains provisions that protect stockholder interests.* The Amended Plan contains features that we believe further align the interests of our employees and directors with those of our stockholders, including a minimum vesting requirement of one year for all time-vesting awards that are made to employees, subject to acceleration in the event of death, disability, retirement, separation of service or a Corporate Transaction (as defined below), and a minimum vesting requirement of the earlier of (1) one year and (2) the next annual meeting of the stockholders for time-vesting awards that are made to directors, subject to acceleration in the event of death, disability or a Corporate Transaction. The Amended Plan also has no automatic acceleration of vesting provisions upon a Corporate Transaction.
- *Equity compensation helps us to attract and retain talent.* A talented, motivated and effective management team and workforce are essential to our continued progress. Equity compensation is an important component of our total compensation because we believe it will incentivize managers and employees to think and act like owners. Our employees are our most valuable assets, and the awards permitted under the Amended Plan are vital to our ability to attract and retain outstanding and highly skilled individuals. If the Amendment is not approved by stockholders, retaining the best talent will be increasingly difficult as the number of shares available and unallocated under the 2018 Plan is projected to fall below the number of shares of common stock that we will need to grant annual equity awards to employees in 2020 at levels comparable to our peers.
- *Continued access to broad-based equity compensation will help enable rapid growth.* To align our new hires with our current stockholders, our practice is to provide new hires with meaningful initial equity awards upon hiring. Of the 1,470,162 shares of common stock underlying equity awards granted in 2018, approximately 31% were issued to new hires, 56% were issued as retention awards to existing employees and 5% were issued to non-employee directors. Since the beginning of 2018, our headcount has increased from 79 to 99 as of March 22, 2019. In 2019, as we advance our product candidates into clinical trials and increase our discovery efforts for new product candidates, we anticipate continuing to increase headcount in our HBV-cure program, our Microbiome program, our clinical team and our general and administrative team. In connection with these new hires, we expect to continue our practice of providing meaningful initial equity awards, as well as making annual awards and retention award grants to existing employees to ensure continued alignment with our stockholders. We believe that our stockholders’ long-term interests are best served by equity compensation awards designed to achieve these goals.
- *We recruit employees in highly competitive labor markets and need to provide competitive compensation arrangements to attract and retain talent.* To attract and retain an experienced and highly educated workforce with the skills necessary to advance our programs, we need to offer competitive compensation packages consisting of attractive cash and equity components.

- *Our current equity-pay mix aligns employee incentives with stockholder gains.* Our employee compensation consists of base salary payable in cash, annual performance-based cash bonuses and long-term incentives payable in the form of equity awards. Historically, most long-term incentive equity awards have consisted of options to purchase shares of common stock; however, the Compensation Committee may consider other equity awards under the Amended Plan, including restricted stock, RSUs, stock appreciation rights and dividend equivalent rights. Our annual long-term performance-based equity incentive award grants are a combination of stock option and restricted stock unit awards. As employees only realize value from stock options and stock appreciation rights if the shares of common stock appreciate and the value of other equity awards depends on the price of our common stock, equity awards provide effective incentives to motivate our employees to increase our stock price. If we are unable to offer equity awards to new and existing employees, we will need to increase the cash component of our compensation. This would divert our cash reserves away from our research and development activities and our clinical trials, which could negatively impact the progress of our product candidates, and in turn, impair stockholder value.
- *Equity compensation helps us avoid business disruption due to compensation programs.* If the Amendment is not approved, we will have to restructure existing compensation programs for reasons not directly related to the achievement of our business objectives. If the Amendment is not approved, it will be necessary to replace components of compensation to be awarded in equity with cash, or with other instruments that may not necessarily align employee interests with those of stockholders as effectively. We believe that such actions would be disruptive to us and our employees.
- *We believe our equity awards create deep, long-term incentives for our employees.* We believe that our employees and other plan participants holding equity is positive for our stockholders as equity represents a long-term interest of our employees and other plan participants in the value of our common stock.

#### **Material Terms of the Amended Plan**

The following is a summary of the other principal provisions of the Amended Plan and its operation, including the proposed Amendment. A copy of the proposed Amendment is attached as Appendix A to this proxy statement. A copy of the full 2018 Plan, with proposed deletions indicated by strike-out and proposed revisions indicated by bold and underline, is attached as Appendix B to this proxy statement and is incorporated herein by reference. The following description of the Amended Plan does not purport to be complete and is qualified in its entirety by reference to Appendix B. Capitalized terms used in this summary and not otherwise defined will have the meanings ascribed to such terms in Amended Plan.

*Purpose of the Amended Plan.* The purpose of the Amended Plan is to encourage ownership in the Company by employees, directors and consultants of the Company and its affiliates whose long-term employment by or involvement with the Company is considered essential to our continued progress and, thereby, aligning the interests of the award recipients and stockholders and permitting the award recipients to share in our success. The Amended Plan provides an essential component of the total compensation package offered to our employees and other plan participants. It reflects the importance placed by the Company on motivating employees and other plan participants to achieve superior results over the long-term and paying employees and other plan participants based on that kind of achievement. We strongly believe that our equity compensation programs and emphasis on employee and non-employee director stock ownership have been integral to our progress and that a continuation of and emphasis on those programs is necessary for us to achieve superior performance in the future. All of our employees, directors and consultants and those of our affiliates are eligible to participate in the Amended Plan.

*Types of Awards.* The Amended Plan provides for the grant of non-qualified and incentive stock options (Options), stock appreciation rights (SAR), dividend equivalent rights, unrestricted stock, restricted stock, RSUs or other rights or benefits under the Amended Plan (collectively, Awards).

*Shares Subject to the Amended Plan.* No more than 3,000,000 shares of common stock may be issued pursuant to Awards under the Amended Plan. The number of shares available for Awards, as well as the terms of outstanding Awards, are subject to adjustment as provided in the Amended Plan for stock splits, stock dividends, recapitalizations and other similar events.

Each share of common stock subject to an Award granted pursuant to the Amended Plan will reduce the aggregate number of shares available under the Amended Plan by one share of common stock. Any shares of common stock that again become available for issuance under the Amended Plan due to a forfeiture, expiration or cancellation of an Award (or if the Award otherwise becomes unexercisable) will generally be added back to the aggregate plan limit of the Amended Plan in this same manner and such shares will again be available for subsequent Awards, except as prohibited by law. In the event any Option or other Award granted under the Amended Plan is exercised through the tendering of shares of common stock (either actually or through attestation) or withholding shares of common stock, or in the event tax withholding obligations are satisfied by tendering or withholding shares of common stock, any shares of common stock so tendered or withheld shall not again be available for awards under the Amended Plan. Shares of Common Stock subject to a SAR granted pursuant to Section 6(k) of the Amended Plan that are not issued in connection with cash or stock settlement of the exercise of the SAR shall not again be available for award under the Amended Plan. Shares of common stock reacquired by the Company on the open market or otherwise using cash proceeds from the exercise of Options shall not be available for awards under the Amended Plan.

*Director Compensation Limit.* The Amended Plan provides that the value of all awards awarded under the Amended Plan and all other cash compensation paid by the Company to any non-employee director in any calendar year shall not exceed \$1,000,000.

*Administration.* The Amended Plan will be administered by the Board or a Committee designated by the Board (the Committee), which committee is constituted in such a manner as to satisfy the applicable laws and to permit such grants and related transactions under the Amended Plan to be exempt from Section 16(b) of the Exchange Act in accordance with Rule 16b-3. Once appointed, such Committee shall continue to serve in its designated capacity until otherwise directed by the Board. Currently, the Compensation Committee generally serves as the Committee specified in the Amended Plan and acts as the Administrator thereunder; however, the Board delegated authority to our Chief Executive Officer acting as a committee of one to serve as the Administrator in the context of granting awards under the Amended Plan to newly hired employees or in connection with promotions to individuals that are not Section 16 officers, direct reports of the Chief Executive Officer or above the level of Vice President. Awards granted by the Chief Executive Officer are limited to a pre-set range prepared in consultation with the Compensation Consultant and consistent with our compensation philosophy. We refer to the entity or individual administering the Amended Plan as the Administrator.

Subject to the terms of the Amended Plan, the Administrator has express authority to determine the employees, directors or consultants who will receive Awards, the number of shares of common stock or other consideration to be covered by each Award, and the terms and conditions of Awards. The Administrator has broad discretion to prescribe, amend and rescind rules relating to the Amended Plan and its administration, to interpret and construe the Amended Plan and the terms of all Award agreements, and to take all actions necessary or advisable to administer the 2018 Plan or to effectuate its purposes. Subject to the terms of the Amended Plan, the Administrator may accelerate the vesting of any Award, allow the exercise of unvested Awards, and may modify, replace, cancel or renew any Award.

*Indemnification.* We will indemnify and defend members of the Committee and their delegates to the extent permitted by law on an after-tax basis against all reasonable expenses, including attorneys' fees, actually and necessarily incurred in connection with the defense of any claim, investigation, action, suit or proceeding, or in connection with any appeal therein, to which they or any of them may be a party by reason of any action taken or failure to act under or in connection with the Amended Plan, or any Award granted thereunder, and against all amounts paid by them in settlement thereof (provided such settlement is approved by the Company) or paid by them in satisfaction of a judgment in any such claim, investigation, action, suit or proceeding, except in relation to matters as to which it shall be adjudged in such claim,



investigation, action, suit or proceeding that such person is liable for gross negligence, bad faith or intentional misconduct; provided, however, that within 30 days after the institution of such claim, investigation, action, suit or proceeding, such person shall offer to us, in writing, the opportunity at our expense to defend the same.

*Minimum Vesting.* Time-based awards granted to employees under the Amended Plan are subject to a one-year minimum vesting requirement other than in the case of death, disability, retirement, separation of service or a Corporate Transaction. Time-based awards granted to directors under the Amended Plan may not vest until the earlier of one year from grant date and the next annual meeting of the stockholders, other than in the case of death, disability or a Corporate Transaction.

*Eligibility.* The Administrator may grant Options that are intended to qualify as incentive stock options (ISOs) only to employees of the Company or an affiliate that is a “parent corporation” or “subsidiary corporation” within the meaning of Section 424 of the Code, and may grant all other Awards to any employee, director or consultant. The Amended Plan and the discussion below use the term “Grantee” to refer to the holder of an Award, or the shares of common stock issuable or issued upon exercise of an Award, under the Amended Plan.

*Options.* Options granted under the Amended Plan provide Grantees with the right to purchase shares of common stock at a predetermined exercise price. The Administrator may grant Options that are intended to qualify as ISOs or Options that do not so qualify (Non-Qualified Stock Options). To qualify as ISOs, Options must meet additional federal tax requirements, including a \$100,000 limit on the value of shares subject to ISOs that first become exercisable by a Grantee in any one calendar year.

*Exercise Price of Options.* The exercise price of ISOs granted to Grantees who own more than ten percent of the common stock of the Company or an affiliate on the grant date of the ISO may not be less than 110% of the fair market value of the shares of common stock subject to the ISO on the grant date. The exercise price of all other Options may not be less than 100% of the fair market value of the shares of common stock subject to the Option on the grant date.

*Exercise of Options.* To the extent exercisable in accordance with the applicable Award agreement, each Option may be exercised in whole or in part, and from time to time during its term, subject to earlier termination relating to a Grantee’s termination of continuous service. With respect to Options, the Administrator has the discretion to accept payment of the exercise price by any of the following methods (or any combination of them): cash or check in U.S. dollars, promissory note with such recourse, interest, security and redemption provisions as the Administrator determines, surrender of shares of common stock, broker assisted exercise, with respect to Options that are not ISOs, by net exercise or by past or future services rendered to the Company or an affiliate.

*Prohibition on Repricing.* Except in connection with certain corporate adjustment events, we may not, without stockholder approval, amend an Award granted under the Amended Plan to reduce the Award’s exercise price per share, cancel and regrant new Awards with lower prices per share than the original price per share of the cancelled Awards, or cancel any Awards in exchange for cash or the grant of replacement Awards with an exercise price that is less than the exercise price of the original Awards, essentially having the effect of a repricing.

*Restricted Stock and Restricted Stock Units.* The Administrator may grant (1) shares of restricted stock that are forfeitable until certain vesting requirements are met and (2) restricted stock units that represent the right to receive payment, in cash or in shares of common stock or other securities or a combination thereof, subject to the passage of time and continuous service or the attainment of performance criteria as established by the Administrator. The Administrator has discretion to determine the terms and conditions under which a Grantee’s interests in restricted stock and restricted stock units become vested and non-forfeitable.

*Unrestricted Stock.* The Administrator may grant unrestricted stock in lieu of paying cash compensation.

*Dividend Equivalent Rights.* The Administrator may grant awards of dividend equivalent rights, which entitle the Grantee to compensation measured by dividends paid with respect to shares of common stock.

*Income Tax Withholding.* As a condition for the issuance of shares of common stock pursuant to Awards, the Amended Plan requires the Grantee to make arrangements as we may require for satisfaction of any applicable federal, state, local or foreign withholding tax obligations that may arise in connection with the Award or the issuance of shares of common stock. Subject to approval by the Administrator, Grantees may elect to have their tax withholding obligations satisfied by tendering previously owned shares of common stock or authorizing the Company to withhold shares of common stock to be issued pursuant to exercise or vesting. Any shares held back to satisfy such tax withholding will not be available for future issuance under the Amended Plan.

*Transferability.* Unless the Administrator provides otherwise, in its sole discretion, no Award may be sold, pledged, assigned, hypothecated, transferred, or disposed of in any manner other than by will or by the laws of descent or distribution and may be exercised, during the lifetime of the Grantee, only by the Grantee. Notwithstanding the foregoing, the Grantee may designate one or more beneficiaries of the Grantee's Award in the event of the Grantee's death on a beneficiary designation form provided by the Administrator.

*Certain Corporate Transactions.* Effective upon the consummation of a Corporate Transaction, all outstanding Awards under the Amended Plan shall terminate unless they are assumed in connection with the Corporate Transaction.

The Administrator has the authority, exercisable either in advance of any actual or anticipated Corporate Transaction or at the time of an actual Corporate Transaction and exercisable at the time of the grant of an Award under the Amended Plan or any time while an Award remains outstanding, to provide for the full or partial automatic vesting and exercisability of one or more outstanding unvested Awards under the Amended Plan and the release from restrictions on transfer and repurchase or forfeiture rights of such Awards in connection with a Corporate Transaction on such terms and conditions as the Administrator may specify. The Administrator also shall have the authority to condition any such Award vesting and exercisability or release from such limitations upon the subsequent termination of the Continuous Service of the Grantee within a specified period following the effective date of the Corporate Transaction. The Administrator may provide that any Awards so vested or released from such limitations in connection with a Corporate Transaction shall remain fully exercisable until the expiration or sooner termination of the Award. Any ISOs accelerated in connection with a Corporate Transaction shall remain exercisable as an ISO under the Code only to the extent the \$100,000 limitation of Section 422(d) of the Code is not exceeded.

"Corporate Transaction" means any of the following transactions, provided, however, that the Administrator shall determine under (4) and (5) whether multiple transactions are related, and its determination shall be final, binding and conclusive: (1) a merger or consolidation in which we are not the surviving entity, except for a transaction the principal purpose of which is to change the state in which we are incorporated; (2) the sale, transfer or other disposition of all or substantially all of our assets; (3) the complete liquidation or dissolution of the Company; (4) any reverse merger or series of related transactions culminating in a reverse merger (including, but not limited to, a tender offer followed by a reverse merger) in which we are the surviving entity but (A) the shares of common stock outstanding immediately prior to such merger are converted or exchanged by virtue of the merger into other property, whether in the form of securities, cash or otherwise, or (B) in which securities possessing more than 50% of the total combined voting power of our outstanding securities are transferred to a person or persons different from those who held such securities immediately prior to such merger or the initial transaction culminating in such merger; or (5) acquisition in a single or series of related transactions by any person or related group of persons (other than the Company or by a Company-sponsored employee benefit plan) of beneficial ownership (within the meaning of Rule 13d-3 of the Exchange Act) of securities possessing more than 50% of the total combined voting power of our outstanding securities.

*Term of the 2018 Plan; Amendments and Termination.* The term of the 2018 Plan is ten years from May 30, 2018, except that no ISOs may be granted after April 5, 2028. The Board may, from time to time, amend, alter, suspend, discontinue or terminate the Amended Plan; provided, that any amendment to increase the number of shares of common stock available for Awards under the Amended Plan and certain other amendments will be subject to stockholder approval. Additionally, no amendment, suspension or

termination of the Amended Plan shall materially and adversely affect Awards already granted unless it relates to an adjustment pursuant to certain transactions that change our capitalization or it is otherwise mutually agreed between the Grantee and the Administrator.

Notwithstanding the foregoing, the Administrator may adopt such amendments to the Amended Plan and the applicable award agreement or adopt other policies and procedures (including amendments, policies and procedures with retroactive effect), or take any other actions, that the Administrator determines are necessary or appropriate to (1) exempt the Award from Section 409A of the Code and/or preserve the intended tax treatment of the benefits provided with respect to the Award, or (2) comply with the requirements of Section 409A of the Code and related Department of Treasury guidance.

*Expected U.S. Federal Income Tax Consequences.* The following is a brief summary of certain U.S. federal tax consequences of certain transactions under the Amended Plan. This summary is not intended to be complete and does not describe state or local tax consequences. Grantees in the Amended Plan should review the current tax treatment with their individual tax advisors at the time of grant, exercise or any other transaction relating to an Award or the underlying shares.

Under the Internal Revenue Code of 1986, as amended (the Code), we will generally be entitled to a deduction for federal income tax purposes at the same time and in the same amount as the ordinary income that Grantees recognize pursuant to Awards. For Grantees, the expected U.S. federal income tax consequences of Awards are as follows:

- *Non-Qualified Stock Options.* A Grantee will not recognize income at the time a Non-Qualified Stock Option is granted. At the time a Non-Qualified Stock Option is exercised, the Grantee will recognize ordinary income in an amount equal to the excess of (a) the fair market value of the shares of common stock issued to the Grantee on the exercise date over (b) the exercise price paid for the shares. At the time of sale of shares acquired pursuant to the exercise of a Non-Qualified Stock Option, the appreciation (or depreciation) in value of the shares after the date of exercise will be treated either as short-term or long-term capital gain (or loss) depending on how long the shares have been held.
- *ISOs.* A Grantee will not recognize income upon the grant of an ISO. There are generally no tax consequences to the Grantee upon exercise of an ISO (except that the amount by which the fair market value of the shares at the time of exercise exceeds the option exercise price is a tax preference item possibly giving rise to an alternative minimum tax). If the shares of common stock are not disposed of within two years from the date the ISO was granted or within one year after the ISO was exercised, any gain realized upon the subsequent disposition of the shares will be characterized as long-term capital gain and any loss will be characterized as long-term capital loss. If either of these holding period requirements are not met, then a “disqualifying disposition” occurs and (a) the Grantee recognizes ordinary income in the amount by which the fair market value of the shares at the time of exercise exceeded the exercise price for the ISO and (b) any remaining amount realized on disposition (except for certain “wash” sales, gifts or sales to related persons) will be characterized as capital gain or loss.
- *Restricted Stock and Restricted Stock Units.* In general, a Grantee will not recognize income at the time of grant of restricted stock or restricted stock units, unless the Grantee elects with respect to restricted shares to accelerate income taxation to the date of the Award by making a timely Section 83(b) election. If the Grantee makes such an election, such Grantee would recognize ordinary compensation income equal to the excess of the fair market value of the restricted shares on the grant date over any amount the Grantee pays for them (in which case subsequent gain or loss would be capital in nature). In the absence of an election to accelerate income taxation to the date of an Award, a Grantee will recognize taxable compensation income at the time the Award vests in an amount equal to the excess of the fair market value of any property that the Grantee receives over the amount paid for such property by the Grantee, or, in the case of restricted stock units, upon receipt of cash or shares of common stock.
- *Unrestricted Stock.* In general, a Grantee will recognize income at the time of grant of unrestricted stock.

- *Parachute Payments.* Under certain circumstances, the accelerated vesting, cash-out or accelerated lapse of restrictions on Awards in connection with a change in control of the Company might be deemed an “excess parachute payment” for purposes of the golden parachute tax provisions of Code Section 280G, and the Grantee may be subject to a 20% excise tax and we may be denied a tax deduction.
- *Income Taxes and Deferred Compensation.* The Amended Plan provides that Grantees are solely responsible and liable for the satisfaction of all taxes and penalties that may arise in connection with Awards (including any taxes arising under Section 409A of the Code). Nevertheless, the Amended Plan permits the Administrator to establish one or more programs under the Amended Plan to permit selected Grantees the opportunity to elect to defer receipt of consideration upon exercise or vesting of an Award or other event that absent the election would entitle the Grantee to payment or receipt of shares of common stock or other consideration under an Award. The Administrator may establish the election procedures, the timing of such elections, the mechanisms for payments of, and accrual of interest or other earnings, if any, on amounts, shares of common stock or other consideration so deferred, and such other terms, conditions, rules and procedures that the Administrator deems advisable for the administration of any such deferral program.

### Eligibility

Persons eligible to participate in the Amended Plan are our employees, directors and other consultants and those of our affiliates as selected from time to time by the Administrator in its discretion. As of March 22, 2019, not including consultants that may be selected for awards by the Administrator in its discretion, approximately 107 individuals are currently eligible to participate in the Amended Plan, which includes five executive officers, 94 full-time employees who are not executive officers, and eight non-employee directors.

### New Plan Benefits

Because the grant of Awards under the Amended Plan is within the discretion of the Administrator, we cannot determine the dollar value or number of shares of common stock that will in the future be received by or allocated to any participant in the Amended Plan. Accordingly, in lieu of providing information regarding benefits that will be received under the Amended Plan, the following table provides information concerning the benefits that were received by the following persons and groups during 2018 and through March 29, 2019 under the 2018 Plan: (a) each named executive officer; (b) all current executive officers, as a group; (c) all current directors who are not executive officers, as a group; and (d) all employees who are not executive officers as a group.

Name and Position	Options		Stock Awards	
	Weighted Average Exercise Price (\$)	Number of Awards (#)	Dollar Value (\$) <sup>(1)</sup>	Number of Awards (#)
Derek A. Small, <i>President and Chief Executive Officer</i>	19.69	65,000	639,925	32,500
Graham Cooper, <i>Chief Financial Officer and Chief Operating Officer</i>	19.69	35,000	2,763,575	117,500
Richard J. Colonno, Ph.D., <i>Executive Vice President and Chief Scientific Officer of Virology Operations</i>	19.69	32,500	803,763	36,250
Uri A. Lopatin, M.D., <i>Chief Medical Officer</i>	19.69	27,500	270,738	13,750
Jacqueline S. Papkoff, Ph.D., <i>Senior Vice President, Chief Scientific Officer Microbiome</i>	21.65	48,750	527,756	24,375
David J. Barrett, <i>Former Chief Financial Officer and Chief Operating Officer</i>	N/A	0	N/A	0

Name and Position	Options		Stock Awards	
	Weighted Average Exercise Price (\$)	Number of Awards (#)	Dollar Value (\$) <sup>(1)</sup>	Number of Awards (#)
All current executive officers, as a group	20.15	208,750	5,005,757 <sup>(2)</sup>	224,375
All current directors who are not executive officers, as a group <sup>(3)</sup>	N/A	0	N/A <sup>(2)</sup>	0
All current employees who are not executive officers, as a group <sup>(4)</sup>	23.32	573,999	4,688,616 <sup>(2)</sup>	216,553

- (1) The valuation of stock awards is based on the grant date fair value computed in accordance with FASB ASC Topic 718. For a discussion of the assumptions used in calculating these values, see Note 7 to of the consolidated financial statements included in the Annual Report on Form 10-K for the fiscal year ended December 31, 2018.
- (2) Represents the aggregate grant date fair value for the group.
- (3) Subject to the terms of the Amended Plan, each non-employee director is expected to be granted options to purchase 10,000 shares of common stock at the Board meeting following the 2019 Annual Meeting.
- (4) Additionally, we have granted 34,800 SARs under the 2018 Plan to current employees that are not executive officers.

### Equity Plans

The following table sets forth information as of December 31, 2018 regarding shares of common stock that may be issued under our equity compensation plans:

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 <sup>(1)</sup> (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 our stockholders	4,668,900 <sup>(2)</sup>	\$ 13.57	1,874,064 <sup>(3)</sup>
Equity compensation plans not approved by our stockholders	551,546 <sup>(4)</sup>	\$ 44.69	259,228
<b>Total</b>	<b>5,205,446</b>		<b>2,133,292</b>

- (1) The weighted average exercise price is calculated solely on the exercise prices of the outstanding stock options and does not reflect the shares that will be issued upon the vesting of outstanding awards of RSUs, which have no exercise price.
- (2) This number includes the following: 531,461 shares subject to stock options granted under the 2010 Equity Incentive Plan (2010 Plan); 3,166,852 shares subject to outstanding awards granted under the 2014 Plan, of which 2,823,847 were subject to outstanding stock options and 343,005 were subject to outstanding RSU awards; 519,349 shares subject to outstanding awards granted under the 2018 Plan of which 279,349 were subject to outstanding stock options, 225,000 were subject to outstanding RSUs and 15,000 were underlying cash-settled stock appreciation rights (which are not included in column (a) but are reflected in column (c)); and 466,238 options assumed by us in connection with our merger with Assembly Pharmaceuticals, Inc. This number excludes purchase rights currently accruing under

the Assembly Biosciences, Inc. 2018 Employee Stock Purchase Plan (2018 ESPP). Under the 2018 ESPP, eligible employees may purchase shares of common stock at a price equal to 85% of the lower of the fair market value of our common stock at the beginning or end of the offering period. No participant in the 2018 ESPP may purchase more than 1,000 shares of common stock in an offering period or shares of common stock valued at more than \$25,000 in a calendar year as determined under the 2018 ESPP.

- (3) This number includes: no shares under the 2010 Plan, which has been frozen; 114,896 shares available for issuance under the 2014 Plan; 1,380,651 shares available for issuance under the 2018 Plan; and 378,517 shares reserved for issuance under the 2018 ESPP. As of February 25, 2019, assuming each participant purchases the maximum number of shares in the current offering period, no more than 63,000 shares are subject to purchase in the current offering under the 2018 ESPP, which ends on May 14, 2019.
- (4) This number includes 536,250 shares subject to stock options granted under the Assembly Biosciences, Inc. 2017 Inducement Plan and 15,296 shares subject to warrants granted to one consultant.

As a result, as of the date of this Proxy Statement, there are approximately 641,523 shares of common stock remaining available and unallocated for issuance under the 2018 Plan.

#### **Required Vote**

Assuming a quorum is present, to be approved, a majority of the shares of common stock held by holders present in person or represented by proxy at the Annual Meeting and entitled to vote on Proposal No. 4 must be voted "FOR" approval of the Amendment. Abstentions will be deemed a vote against Proposal No. 4. Broker non-votes will not be considered towards vote totals on Proposal No. 4.

#### **Recommendation of the Board of Directors**

**THE BOARD OF DIRECTORS RECOMMENDS A VOTE "FOR" APPROVAL OF THE AMENDMENT TO THE ASSEMBLY BIOSCIENCES, INC. 2018 STOCK INCENTIVE PLAN.**

## EXECUTIVE OFFICERS

As of March 22, 2019, our executive officers are: Derek A. Small, our President and Chief Executive Officer; Graham Cooper, our Chief Financial Officer and Chief Operating Officer, Richard J. Colonno, Ph.D.; our Executive Vice President and Chief Scientific Officer of Virology Operations; Uri A. Lopatin, M.D., our Chief Medical Officer; and Jacqueline S. Papkoff, Ph.D., our Senior Vice President, Chief Scientific Officer Microbiome. Information regarding each of Mr. Cooper and Drs. Colonno, Lopatin and Papkoff is below. For information on Mr. Small, see “Proposal No. 1 — Election of Directors — Nominees for Director.”

Name	Age (as of 3/22/19)	Business Experience
Graham Cooper	49	Mr. Cooper joined as Chief Financial Officer and Chief Operating Officer in March 2018. Mr. Cooper was the Chief Financial Officer of Receptos, Inc. (Receptos) from February 2013 until Receptos was acquired by Celgene Corporation in August 2015. Following Celgene’s acquisition of Receptos and before joining us, Mr. Cooper served as a consultant and director to various other biotechnology companies. In 2012, Mr. Cooper was the Executive Vice President, Finance and Chief Financial Officer of Geron Corporation, a biopharmaceutical company focused on cancer therapies. From 2006 until 2011, Mr. Cooper served as Senior Vice President, Chief Financial Officer and Treasurer of Orexigen Therapeutics, Inc., a biotechnology company focused on obesity. From 1999 to 2006, Mr. Cooper held positions of increasing responsibility including Director, Health Care Investment Banking, at Deutsche Bank Securities, where he was responsible for executing and managing a wide variety of financing and merger and acquisition transactions in the life sciences field. From August 1992 to January 1995, he worked as an accountant at Deloitte & Touche, and was previously a C.P.A. Mr. Cooper currently serves on the Board of Directors for Kezar Life Sciences, Inc. (Nasdaq: KZR) and Unity Biotechnology, Inc. (Nasdaq: UBX) and Bioniz Therapeutics, Inc., a privately-held company. Mr. Cooper holds a B.A. in Economics from the University of California, Berkeley and an M.B.A. from the Stanford Graduate School of Business.
Richard J. Colonno, Ph.D.	69	Dr. Colonno is our Executive Vice President and Chief Scientific Officer of Virology Operations. Dr. Colonno joined as Chief Scientific Officer in January 2016 and became Executive Vice President and Chief Scientific Officer of Virology Operations in January 2018. Dr. Colonno has been instrumental in the discovery and development of multiple approved antiviral drugs, including Baraclude <sup>®</sup> and Reyataz <sup>®</sup> . From September 2007 to January 2016, Dr. Colonno was the Chief Science Officer of Presidio Pharmaceuticals, Inc., where he directed its hepatitis C (HCV) antiviral programs, including the discovery and development of the HCV NS5A inhibitor ravidasvir. From June 1991 to August 2007, Dr. Colonno was Vice President, Infectious Diseases Drug Discovery at Bristol-Myers Squibb Co., where he played a pivotal role in building Bristol-Myers Squibb’s antiviral franchise. From August 1982 to May 1991, he was Senior Director of Antiviral Research at Merck Research Labs. Dr. Colonno received a B.A.

Name	Age (as of 3/22/19)	Business Experience
Uri A. Lopatin, M.D.	47	<p>in Biology and Chemistry from Kansas Wesleyan University and a Ph.D. in Microbiology from the University of Kansas and has co-authored more than 160 scientific articles.</p> <p>Dr. Lopatin joined as Chief Medical Officer and Vice President Research and Development in July 2014 upon the closing of the Merger. Prior to the Merger, Dr. Lopatin was Chief Medical Officer and Vice President Research and Development, a position he held since October 2012. Prior to that, he was a Senior Director for Clinical and Translational Research – Liver Disease at Gilead Sciences, Inc. from October 2010 to September 2012 and a Translational Medical Leader at Roche from May 2008 to September 2010. He has designed and coordinated preclinical and clinical collaborations, as well as phase I through IV clinical studies of multiple new molecular entities. Dr. Lopatin has published extensively, particularly on hepatitis B and immunology and is a co-author of multiple patents in the field of treatment and diagnosis for viral hepatitis. Dr. Lopatin received his Infectious Disease Board certification following fellowship training in Infectious Disease at the National Institute of Health, and he received internal medicine board certification following completion of residency at New York University. Dr. Lopatin received a B.S. in Biology, cum laude with distinction, from Cornell University and received his M.D. degree from the University of Medicine and Dentistry of New Jersey — New Jersey Medical School, where he was awarded the Stanley S. Bergen medal of excellence.</p>
Jacqueline S. Papkoff, Ph.D.	63	<p>Dr. Papkoff joined as Senior Vice President, Chief Scientific Officer Microbiome in April 2018. Dr. Papkoff was Senior Vice President, Research at Evelo Biosciences, Inc. from May 2016 to October 2017. From January 2013 to May 2016, Dr. Papkoff was Vice President, Immunology Scientific Innovation at Johnson &amp; Johnson California Innovation Center as a representative of the Janssen immunology therapeutic area. From 2008 to 2012, Dr. Papkoff was an independent biotherapeutic research and development consultant to biotech and pharmaceutical companies. In 2006 and 2007, Dr. Papkoff was Executive Vice President Therapeutics, Chief Scientific Officer at CFD Therapeutics, Inc. From 2002 until 2006, Dr. Papkoff was initially Vice President, Discovery and later Executive Vice President, Therapeutics at diaDexus, Inc. Dr. Papkoff received a B.A. in Biology with highest honors from the University of California, Santa Cruz and received a Ph.D. in Biology from the University of California, San Diego.</p>



## EXECUTIVE COMPENSATION

### Compensation Discussion and Analysis

#### *Compensation Philosophy and Overview*

In general, our compensation philosophy is to provide competitive overall compensation that attracts, retains and motivates superior performers. The Compensation Committee believes that executive compensation should be designed to promote both our short-term and long-term goals. Accordingly, an important component of the Committee's compensation philosophy is to align the financial interests of our executive officers with those of our stockholders. Every year, we give our stockholders an opportunity to cast an advisory vote to approve the compensation of our named executive officers (NEOs). At each of our annual meetings of stockholders held since 2015, which was our first annual meeting of stockholders after our acquisition of Assembly Pharmaceuticals, Inc., over 90% of the votes cast on our "Say on Pay" proposal have been voted in favor of the proposal. At our 2018 Annual Meeting of Stockholders, approximately 93% of the votes cast on our Say on Pay proposal were voted in favor of the proposal. The Compensation Committee considered the results of the non-binding, advisory vote in establishing the fiscal 2019 compensation, and the Compensation Committee believed the result of the Say on Pay vote was a confirmation that stockholders were in general agreement with its compensation philosophy and practice. The Compensation Committee values the input of our stockholders and will continue to consider the Say on Pay voting results and other feedback provided by our stockholders when making future compensation decisions concerning our executive officers.

To achieve the above goals, our compensation program is structured to:

- **Pay for Performance:** We offer (1) targeted annual performance-based cash bonus opportunities based on individual achievement and Company-wide performance against corporate goals, which are generally measured over a 12-month period, and (2) the opportunity to share in our long-term success through equity compensation;
- **Attract and Retain Superior Performers:** We provide a market-competitive base salary, performance-based cash bonus opportunities, long-term equity awards and other compensation elements that are competitive with those companies that are competing for available employees; and
- **Pay Equitably:** We believe that it is important to apply generally consistent guidelines for all of our NEOs. To deliver equitable pay, the Compensation Committee considers each NEO's level and complexity of responsibility, criticality, qualifications and performance, both individually and in a team context.

In addition to striving to meet the goals above, we have instituted the following executive compensation best practices:

What We Do	What We Don't Do
✓ Annual performance-based cash bonus opportunities tied to individual and Company-wide performance	✗ No guaranteed bonuses
✓ Equity grants have multi-year vesting requirements	✗ No tax gross-ups
✓ Time-based equity grants have minimum vesting period of one year	✗ No special retirement plans for executives
✓ Compensation Committee is entirely independent	✗ No special health or welfare benefits
✓ Use an independent compensation consultant	✗ No hedging of our stock
✓ Double-trigger severance and equity acceleration rights	✗ No pledging of our stock without pre-approval
✓ Limited perquisites	

To implement its compensation philosophy, the Compensation Committee has determined that the primary elements of our NEOs' compensation should consist of base salary, annual performance-based cash bonus and long-term equity incentive awards.

#### *Looking Ahead to 2019*

No significant changes will be made to our compensation structure in 2019. The Compensation Committee has set annualized base salaries and target performance-based cash bonus percentages, which are set as a percentage of our employees' (including our NEOs') annualized base salary. These target bonus percentages are largely informed by the ranges of target bonus percentages for similar positions at companies in our peer group. Annual performance-based cash bonuses for 2019 will be based on the achievement of significant Company goals, including goals related to research and clinical development, financial achievements, business development and operational milestones, as well as specific goals tailored to the NEOs' areas of responsibility. The Board approved the Company-wide performance goals in the first quarter of 2019, but actual bonus amounts will be determined and paid out in the first quarter of 2020 based on achievement of the Company-wide and individual performance goals. The Board or the Compensation Committee may increase or decrease an NEO's bonus payment (either above or below that NEO's target bonus percentage) based on its assessment of the Company's performance and each NEO's 2019 individual performance.

#### *Named Executive Officers*

Our NEOs for 2018 are as follows:

Name	Title
Derek A. Small	President and Chief Executive Officer
Graham Cooper <sup>(1)</sup>	Chief Financial Officer and Chief Operating Officer
Richard J. Colonno, Ph.D.	Executive Vice President and Chief Scientific Officer of Virology Operations
Uri A. Lopatin, M.D.	Chief Medical Officer
Jacqueline S. Papkoff, Ph.D.	Senior Vice President, Chief Scientific Officer Microbiome
David J. Barrett <sup>(1)</sup>	Former Chief Financial Officer and Chief Operating Officer

- (1) On March 8, 2018, Mr. Barrett stepped down as Chief Financial Officer and Chief Operating Officer and the Board appointed Mr. Cooper to replace Mr. Barrett in both roles.

#### *Our Management Team's 2018 Accomplishments*

- Further augmented the research and development teams for our two innovative platform programs, our hepatitis B virus (HBV)-cure program and our Microbiome program.
- Improved operational and administrative functions.
- Raised net proceeds of approximately \$155.4 million from the sale and issuance of shares of common stock.
- Expanded our operational capabilities in China.

#### HBV-cure program

- Completed an additional Phase 1a pharmacokinetic (PK), safety and tolerability study and Phase 1b study of antiviral effects of ABI-H0731 and reported results at major scientific conferences.
- ABI-H0731 was designated as a "Best of AASLD 2018" selection for our Phase 1b data presentation.

- Received Fast Track designation from the U.S. Food and Drug Administration for ABI-H0731 for the treatment of patients with chronic HBV infection.
- Initiated two Phase 2a clinical studies in HBV in July 2018 for ABI-H0731.
- Initiated a Phase 1a/1b dose-ranging clinical study of ABI-H2158, our second clinical candidate.
- Selected ABI-H3733 as our third clinical candidate and initiated IND-enabling studies.

#### Microbiome program

- Filed an IND application in December 2018 for ABI-M201 for a Phase 1b study for mildly to moderately active ulcerative colitis.

#### *Independent Compensation Consultant*

Since 2015, the Compensation Committee has retained Radford, a part of Aon plc, as the Compensation Committee's independent outside compensation consultant (Compensation Consultant). The Compensation Consultant's fees were paid by the Company but approved by the Compensation Committee. In connection with its retention for the 2018 compensation cycle, the Compensation Consultant conducted analysis and provided advice on, among other things, the appropriate peer group, annual performance-based cash bonuses, long-term equity incentive awards, severance arrangements and annual compensation for the executive officers and compensation trends in the biotechnology industry. The Compensation Committee evaluates the criteria used in establishing the peer group at least annually to ensure that it appropriately represents the companies competing with us to attract and retain talent. The Compensation Committee seeks input from management in addition to the Compensation Consultant to ensure the peer group is reflective of our current and future business objectives and strategy.

The Compensation Consultant reports directly to the Compensation Committee, which retains sole authority to direct the work and employ the consultant. The Compensation Committee regularly reviews the services provided by the Compensation Consultant.

The Compensation Committee has assessed the independence of the Compensation Consultant and determined that the Compensation Consultant's work did not raise any conflicts of interest in 2018. In making this assessment, the Compensation Committee considered the independence factors enumerated in Rule 10C-1(b) under the Exchange Act, including (1) the fact that the Compensation Consultant does not provide any other services to us, (2) the level of fees received from us as a percentage of the Compensation Consultant's total revenue is less than 1%, (3) the Compensation Consultant has internal policies and procedures to prevent conflicts of interest and protect independence, (4) the individual Compensation Consultant advisers to the Compensation Committee do not own any of our stock or have any business or personal relationships with members of the Compensation Committee or our executive officers and (5) the Compensation Committee is unaware of any relationship that may exist between executive officers and the Compensation Consultant. The Compensation Committee continues to monitor the independence of the Compensation Consultant on a periodic basis.

#### ***Compensation Adjustments and Peer Group Process***

Our compensation philosophy has been implemented under the supervision of the Compensation Committee. Our Compensation Committee reviews and approves the compensation for our Chief Executive Officer (CEO). The Compensation Committee also has direct responsibility for reviewing and approving the compensation of each of our other executive officers. To assist the Compensation Committee, the CEO makes recommendations to the Compensation Committee as to specific elements (i.e., base salary, annual performance-based cash bonus and long-term equity incentive awards) of compensation for the other executive officers. The CEO does not make recommendations with respect to his own compensation. Management, under the guidelines and policies established by the Compensation Committee, makes decisions on all aspects of compensation for non-executive officer employees.

Our CEO, General Counsel, Senior Vice President, Human Resources and Organization Development, and Chief Financial Officer/Chief Operating Officer, in addition to the Compensation Consultant and outside legal counsel, regularly attend portions of the Compensation Committee meetings to provide

analysis, information and management's recommendations on various human resources and compensation matters. Members of management generally do not participate in the executive sessions of the Compensation Committee unless invited by the Compensation Committee to provide specific information during closed session. The CEO is not present for any deliberation on, or votes related to, his compensation.

We generally review our compensation practices on an annual basis over the course of several meetings of the Compensation Committee and the Board. The first step in the process is that the Compensation Committee, with the support of its Compensation Consultant and management, reviews trends in biotechnology compensation practices and reviews and approves the list of peer companies used for benchmarking. As part of its analysis for 2018, the Compensation Consultant collected and analyzed compensation information from a comparative group of biotechnology companies, or peer group, approved by the Compensation Committee. The Compensation Committee evaluates the criteria used in establishing the peer group at least annually to ensure that it appropriately represents the companies competing with us to attract and retain talent. The Compensation Committee seeks input from management in addition to the Compensation Consultant to ensure the peer group is consistent with our current business objectives and strategy.

The list of peer companies is approved based on various factors including industry classification, market capitalization, headcount and stage of development. In October 2017, with assistance from the Compensation Consultant, the Compensation Committee re-evaluated the peer group. The Committee approved a peer group consisting of biopharmaceutical companies at varying stages of development ranging from Phase 1 through Phase 3 clinical development with market capitalizations generally between \$150 million and \$1.5 billion and generally fewer than 250 employees. Based on these criteria, the Compensation Committee approved the revised peer group (the 2018 Peer Group) set forth below and used the 2018 Peer Group to inform compensation decisions for 2018.

Achillion Pharmaceuticals, Inc.*	CytomX Therapeutics, Inc.*	Protagonist Therapeutics, Inc.*
Arbutus Biopharma Corp.	Editas Medicine, Inc.	REGENXBIO Inc.*
Audentes Therapeutics, Inc.	Five Prime Therapeutics, Inc.*	Sangamo Therapeutics, Inc.
AveXis, Inc.*	Ignyta, Inc.	Selecta Biosciences, Inc.*
Bellicum Pharmaceuticals, Inc.	Immune Design Corp.	Seres Therapeutics, Inc.*
Calithera Biosciences, Inc.	Iovance Biotherapeutics, Inc.*	Wave Life Sciences Ltd.*
Chimerix, Inc.*	Mirati Therapeutics, Inc.	

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\* Company added to 2018 Peer Group.

As of October 2017, when the Compensation Consultant completed its work developing recommendations for the 2018 Peer Group, the 50<sup>th</sup> percentile of market capitalization and headcount of the 2018 Peer Group were \$559.2 million and 88 employees, respectively. Meanwhile, our market capitalization and headcount were \$511.7 million and 81 employees, respectively.

After the list of peer companies is approved, management and the Compensation Consultant present the Compensation Committee with recommendations regarding proposed adjustments to compensation elements and a variety of supporting data, including comparative compensation information from the approved peer group. This is presented individually for the NEOs. These recommendations are discussed with and without management present and are discussed with the Compensation Consultant. The Compensation Committee then determines what, if any, adjustments to the compensation elements are appropriate for executive officers other than the CEO. For 2018 compensation, the Compensation Committee used the 2018 Peer Group to inform its decision-making regarding both the elements of compensation (i.e., base salary, annual performance-based cash bonuses and long-term equity incentive awards) and total compensation. The Compensation Committee's general philosophy is that base salary and annual performance-based bonus opportunities should target the 50<sup>th</sup> percentile of our peers, and long-term equity incentive compensation should be targeted between the 50<sup>th</sup> and 75<sup>th</sup> percentile of our

peers to achieve our overall compensation-related goals, but the Compensation Committee may, in its discretion, set any individual NEO's compensation above or below these levels, based on that individual's experience, criticality, amount of responsibility and either individual or Company-wide performance. The Compensation Committee targets a range between the 50<sup>th</sup> and 75th percentile of our peers when granting long-term equity incentive awards to give our employees, including our NEOs, the opportunity to share in the long-term growth of our Company. Exceptions to the Compensation Committee's general philosophy may be made under exceptional circumstances.

The Compensation Committee also reviews the market information provided by the Compensation Consultant, considers the CEO's performance and experience and makes determinations regarding adjustments to the CEO's compensation. These discussions are conducted in executive sessions without involvement by management.

#### *Components of our Executive Compensation Program*

The principal components of our executive compensation program are base salary, annual performance-based cash bonus and long-term equity incentive awards. Our Compensation Committee believes that each component of executive compensation must be evaluated and determined with reference to competitive market data, individual and Company-wide performance, our recruiting and retention goals, internal equity and consistency, and other information it deems relevant. The Compensation Committee believes that in the biopharmaceutical/biotechnology industry, stock option and/or other equity awards are a primary motivator in attracting and retaining executives, in addition to salary and cash incentive bonuses.

The primary components of our compensation package are described in more detail below.

#### **Base Salary**

We provide base salaries for our NEOs to compensate them for their services rendered during the fiscal year. Base salaries for our NEOs have been established based on each individual's position, criticality and scope of responsibilities, prior experience and training, and competitive market-based compensation data we review for similar positions in our industry.

Base salaries are reviewed periodically and may be increased for merit reasons based on the executive's performance, for retention reasons or if the base salary is not competitive with salaries paid by comparative companies for similar positions. Additionally, we may adjust base salaries throughout the year for promotions or other changes in the scope or breadth of an executive's role or responsibilities. We may also adjust base salaries downward based on a review of base salaries among our peer group. The NEOs' annualized base salaries for 2017 and 2018, effective as of March 1 of each year were as follows:

NEO	2017	2018	Percentage Increase
Derek A. Small	\$475,000	\$525,000	10.5%
Graham Cooper <sup>(1)</sup>	—	425,000	—
Richard J. Colonno, Ph.D.	391,400	410,000	4.8%
Uri A. Lopatin, M.D.	367,500	390,000	6.1%
Jacqueline S. Papkoff, Ph.D. <sup>(2)</sup>	—	360,000	—

(1) Mr. Cooper became our Chief Financial Officer and Chief Operating Officer effective March 8, 2018.

(2) Dr. Papkoff became our Senior Vice President, Chief Scientific Officer Microbiome effective April 2, 2018.

Mr. Small and Drs. Colonno and Lopatin received base salary increases of 10.5%, 4.8% and 6.1%, respectively. Each of these increases resulted from a number of different factors, including our overall strong performance in 2017, including, among other accomplishments, completing Phase 1a human safety studies of ABI-H0731, initiating Phase 1b clinical studies of ABI-H0731 in hepatitis B patients and IND-enabling studies of ABI-H2158, advancing a number of third-generation molecules toward possible candidate selection in our HBV-cure program and establishing our collaboration with Allergan Pharmaceuticals International Limited (Allergan).

In addition to merit-based increases based on our 2017 performance, the base salary increases for Mr. Small and Dr. Lopatin were also made to bring their base salaries more in line with CEOs and Chief Medical Officers at comparable companies, including our peer group. Dr. Colunno's increase was also merit-based as a result of our strong 2017 performance, particularly in our HBV-cure program, which he oversees, as well as due to a shift in the complexity of the HBV-cure program as we have continued to develop product candidates and advance them through clinical development and IND-enabling studies.

#### **Annual Performance-Based Cash Bonus**

A significant element of the cash compensation of our NEOs is an annual performance-based cash bonus to reward strong performance and retain our NEOs in a competitive labor market. These bonuses are intended to reward our NEOs for achieving or exceeding our shorter-term corporate goals, which are designed to be measured over a calendar year, and to provide our NEOs with additional incentive to achieve these goals.

Performance-based cash bonuses were determined and paid pursuant to the 2018 Discretionary Bonus Plan (the 2018 Bonus Plan). The 2018 Bonus Plan became effective January 1, 2018 and was designed to motivate, retain and reward employees in 2018. Under the 2018 Bonus Plan, annual performance-based cash bonuses were paid to our employees, including our NEOs, based on achievement of (1) Board-approved Company-wide objectives weighted to reflect their relative importance to our achievement of our goals, including research and clinical development, financial, business development and operational milestones and (2) individual performance objectives, which included certain department, group and/or team objectives applicable to the participants, tailored to the NEOs' areas of responsibility. Performance-based cash bonus targets for our NEOs in 2017 and 2018 were as follows:

NEO	2017 Target Bonus		2017 Actual Bonus		2018 Target Bonus		2018 Actual Bonus	
	Percentage of Base Salary	Amount	Amount	Percentage of Target Bonus	Percentage of Base Salary	Amount	Amount	Percentage of Target Bonus
Derek A. Small	50%	\$237,500	\$250,000	105%	50%	\$262,500	\$279,000	106%
Graham Cooper <sup>(1)</sup>	—	—	—	—	40%	\$138,507	\$157,200	113%
Richard J. Colunno, Ph.D.	40%	\$156,560	164,000	105%	40%	\$164,000	\$182,000	111%
Uri A. Lopatin, M.D.	35%	\$128,625	\$128,700	100%	35%	\$136,500	\$146,400	107%
Jacqueline S. Papkoff <sup>(2)</sup>	—	—	—	—	35%	\$ 94,500	\$104,900	111%
David J. Barrett	50%	\$192,500	\$204,600	106%	—	—	—	—

- (1) Mr. Cooper became our Chief Financial Officer and Chief Operating Officer effective March 8, 2018. As such, his target bonus was prorated accordingly.
- (2) Dr. Papkoff became our Senior Vice President, Chief Scientific Officer Microbiome effective April 2, 2018. As such, her target bonus was prorated accordingly.

The 2018 corporate performance goals were reviewed by our Compensation Committee and approved by the Board in the first quarter of 2018. The actual bonus amounts were determined in the first quarter of 2019 based on achievement of the pre-determined Company-wide and individual performance goals. For 2018, annual performance-based cash bonuses were based on achievement of Company-wide goals related to development of our HBV-cure and Microbiome programs, including research and development, financial operations/investor relations and business development goals, including third-party collaborations. These included:

- Advance our HBV-cure program's first core inhibitor product candidate, ABI-H0731, into a Phase 2a clinical study and obtain initial data;
- Complete nonclinical profiling of our second core inhibitor product candidate, ABI-H2158, and initiate a Phase 1a clinical study;
- Identify a third core inhibitor product candidate and advance it into IND-enabling studies;
- Complete nonclinical profiling and file IND for ABI-M201, our Microbiome program's first product candidate in collaboration with Allergan Pharmaceuticals International Limited (Allergan);

- Identify and advance a second product candidate in the Microbiome program;
- Ensure inflow of capital greater than \$100.0 million to fund ongoing research and development for our HBV-cure and Microbiome programs; and
- Establish dedicated team in China to develop our HBV-cure and Microbiome programs through a domestic Chinese entity and file a clinical study application for a Category 1 drug.

After receiving and considering the analysis and recommendations of management, the Compensation Committee determined that the percentage achievement for the 2018 corporate objectives was 106.25%. In determining individual performance-based bonus payouts, each NEO's potential performance-based cash bonus was weighted differently, depending on the respective area of responsibility and contributions to achieving our Company-wide goals. The Chief Executive Officer's potential performance-based cash bonus was based exclusively on achievement of the Company-wide goals. The other NEOs' performance-based cash bonuses were weighted 75% on achievement of the Company-wide goals and 25% on individual performance. Mr. Cooper's individual performance was evaluated based on his expertise exhibited in connection with our securities offering in July 2018, which resulted in net proceeds of approximately \$155.4 million, as well as optimization of our growing general and administrative functions. Dr. Colonna's individual performance was evaluated based on the progress of the HBV-cure program generally, including both clinical advancement of ABI-H0731 and ABI-2158, as well as continuing discovery efforts, such as the identification of ABI-H3733 and its subsequent advancement into IND-enabling studies. Dr. Lopatin's individual performance was evaluated based on the clinical progress of the HBV-program, including the advancement of ABI-H0731 into Phase 2a studies, clinical design and collection of initial data and initiation of Phase 1a clinical studies of ABI-H2158. Dr. Papkoff's individual performance was evaluated based on progress and advancements made by the Microbiome program team generally, including the completion of nonclinical profiling and subsequent filing of an IND for ABI-M201 in collaboration with Allergan and the advancement of a second product candidate in collaboration with Allergan. The Compensation Committee determined that each of the HBV-cure program, the Microbiome program and the Company exceeded their 2018 goals, resulting in an above target bonus payouts.

#### ***Long-term Equity Incentive Awards***

Our equity-based long-term incentive program is designed to align our NEOs' long-term incentives with those of our stockholders. We believe that long-term participation by our employees, including our NEOs, in equity-based awards is a critical factor in the achievement of long-term Company goals and business objectives. In approving equity awards, the Compensation Committee's and the Board's guiding principle is to create a program that is designed to motivate management to (1) generate significant total stockholder return as measured by sustained increases in our stock price and (2) retain skilled employees. In furtherance of these objectives, equity awards to NEOs and other employees are a critical component of our compensation practices. Because employees profit from stock options only if our stock price increases relative to the stock option's exercise price, we believe stock options provide meaningful incentives to employees to achieve increases in the value of our stock over time. In 2018, we changed our annual grants from being solely grants of stock options to a mix of stock options and time-based RSUs. We believe that RSU grants are effective tools to motivate our employees, including our NEOs, to achieve longer-term financial goals that we expect to lead to increased value to our stockholders with less dilution to our stockholders.

Awards to our executive officers other than our CEO are recommended by the CEO and the Compensation Consultant and approved by the Compensation Committee. Grants of awards to our CEO are discussed and determined by the Compensation Committee, in consultation with the Compensation Consultant, without the CEO being present.

#### ***Annual Equity Grants***

In determining the size of annual equity grants, the Compensation Committee considers the value of existing long-term equity incentive awards, internal pay equity considerations and individual and Company-wide performance. For additional detail regarding individual and Company-wide performance,

see “— Annual Performance-Based Cash Bonus.” After considering these factors, in March 2018, our Compensation Committee approved the stock option and RSU grants to Mr. Small and Drs. Colonno and Lopatin. These annual grants are summarized in the table below.

NEO	Options to Purchase Common Stock		Restricted Stock Units	
	Number of Shares	Grant Date Fair Value <sup>(1)</sup>	Number of Shares	Grant Date Fair Value <sup>(1)</sup>
Derek A. Small	65,000	\$2,258,020	32,500	\$1,597,050
Graham Cooper <sup>(2)</sup>	—	—	—	—
Richard J. Colonno, Ph.D.	30,000	1,042,163	15,000	737,100
Uri A. Lopatin, M.D.	15,000	521,082	7,500	368,550
Jacqueline S. Papkoff, Ph.D. <sup>(2)</sup>	—	—	—	—

- (1) The reported amounts represent the grant date fair value of the award, computed in accordance with FASB ASC Topic 718 disregarding any estimated forfeitures related to service-based vesting. Assumptions used in the calculation of these amounts are included in Note 7 of the consolidated financial statements included in the Annual Report on Form 10-K for the year ended December 31, 2017.
- (2) Mr. Cooper and Dr. Papkoff joined us in March and April 2018, respectively. As such, they did not receive 2018 annual equity grants.

The annual stock option and RSU awards granted to Mr. Small and Drs. Colonno and Lopatin vest over four years, subject to continued service. In each case, we believe the applicable vesting schedule encourages long-term employment with Assembly, while allowing our NEOs to realize compensation in line with the value that they have created for our stockholders.

#### *Inducement Equity Grants*

In connection with Mr. Cooper joining us as our Chief Financial Officer and Chief Operating Officer in March 2018 and Dr. Papkoff joining us as our Senior Vice President, Chief Scientific Officer Microbiome, we made inducement grants of stock options in March and April 2018, respectively. These inducement grants are summarized in the table below.

NEO	Options to Purchase Common Stock	
	Number of Shares	Grant Date Fair Value <sup>(1)</sup>
Derek A. Small	—	—
Graham Cooper	220,000	\$8,853,732
Richard J. Colonno, Ph.D.	—	—
Uri A. Lopatin, M.D.	—	—
Jacqueline S. Papkoff, Ph.D.	106,200	3,518,383

- (1) The reported amounts represent the grant date fair value of the award, computed in accordance with FASB ASC Topic 718 disregarding any estimated forfeitures related to service-based vesting. Assumptions used in the calculation of these amounts are included in Note 7 of the consolidated financial statements included in the Annual Report on Form 10-K for the year ended December 31, 2017.

We sought market-based input from the Compensation Consultant in connection with determining appropriate values of these inducement grants. We also accounted for individual factors in each case when preparing to make employment offers to Mr. Cooper and Dr. Papkoff. In Mr. Cooper’s case, we gave significant weight to his history serving as Chief Financial Officer of three separate biopharmaceutical and biotechnology companies. Mr. Cooper’s experience managing securities offerings to raise capital, as well as his experience as an investment banker in the healthcare sector were also important factors, because we



expect to need to raise significant amounts of capital as our product candidates progress through clinical studies. In Dr. Papkoff's case, we gave significant weight to her experience serving in senior roles overseeing discovery, innovation and research programs, internal positioning within the Company and the criticality of the position due to the fact that our Microbiome program had been without a Chief Scientific Officer since that program's prior Chief Scientific Officer stepped down in October 2017. Mr. Cooper's inducement grant vests over three years, and Dr. Papkoff's inducement grant vests over four years, subject in each case to continued service. We believe that these vesting schedules encourage long-term employment with us and allow both Mr. Cooper and Dr. Papkoff to realize enhanced compensation in line with the value that we expect them to create for our stockholders.

#### *Retention Equity Grants and Performance Achievement Grant*

In December 2018, in recognition of the significant volatility of stock prices in our industry, our Compensation Committee approved retention equity grants to all employees at the VP level and above, other than founders, which includes Mr. Small and Dr. Lopatin, and Dr. Colonna. Mr. Small and Dr. Lopatin did not receive retention equity grants, because they were co-founders of Assembly Pharmaceuticals, and Dr. Colonna did not receive a retention equity grant, because he received a performance-based RSU award in 2017 (Colonna 2017 RSU Award), which has not yet fully vested.

The retention equity grants include awards of (1) 100,000 time-based vesting RSUs (subject to acceleration but not before December 12, 2019 upon the achievement of certain performance milestones) to Mr. Cooper, our Chief Financial Officer and Chief Operating Officer and (2) a mix of 10,625 time-based vesting RSUs and 21,250 stock options to Dr. Papkoff, our Senior Vice President, Chief Scientific Officer Microbiome. In addition, in December 2018, the Compensation Committee determined that one of the performance milestones set forth in the Colonna 2017 RSU Award had been achieved. Accordingly, Dr. Colonna, our Executive Vice President and Chief Scientific Officer of Virology Operations, was granted 20,000 fully vested RSUs. These grants are summarized in the table below.

NEO	Options to Purchase Common Stock		Restricted Stock Units	
	Number of Shares	Grant Date Fair Value <sup>(1)</sup>	Number of Shares	Grant Date Fair Value <sup>(1)</sup>
Derek A. Small	—	—	—	—
Graham Cooper	—	—	100,000	\$2,419,000
Richard J. Colonna, Ph.D.	—	—	20,000	483,800
Uri A. Lopatin, M.D.	—	—	—	—
Jacqueline S. Papkoff, Ph.D.	21,250	357,700	10,625	257,019

- (1) The reported amounts represent the grant date fair value of the award, computed in accordance with FASB ASC Topic 718 disregarding any estimated forfeitures related to service-based vesting. Assumptions used in the calculation of these amounts are included in Note 7 of the consolidated financial statements included in the Annual Report on Form 10-K for the year ended December 31, 2017.

The Compensation Committee approved the retention equity grants made to Mr. Cooper and Dr. Papkoff in part because the exercise prices of the stock options granted as inducement equity grants discussed above were significantly higher than our stock price at the time of the retention equity grants, which could cause the inducement grants to lose their function as a retention incentive. The retention equity grants were in Mr. Cooper's case, solely comprised of RSUs and in Dr. Papkoff's case, a mix of RSUs and stock options, to provide Mr. Cooper and Dr. Papkoff with incentives that have value notwithstanding stock price volatility. Mr. Cooper's RSUs vest over two and a half years, and Dr. Papkoff's stock option and RSU awards vest over three years, subject in each case to continued service. In each case, we believe these vesting schedules encourage long-term employment with us.

*Other Grants*

In June 2018, in connection with Mr. Barrett's transition from an employee to a consultant, we granted Mr. Barrett 100,000 RSUs, which had a grant date fair value of \$4,317,000 as computed in accordance with FASB ASC Topic 718. These RSUs vest over two and a half years and are subject to deferred settlement on certain specified dates or the earlier occurrence of a change of control. At the time of his separation, Mr. Barrett was our longest-tenured employee, having served us since prior to our acquisition of Assembly Pharmaceuticals, Inc. Mr. Barrett's extensive experience in the biotechnology industry, including directly serving in and later overseeing our investor relations function, led him to develop close business relationships with a number of our institutional investors, some of whom continue to hold positions among our largest stockholders. This deep knowledge of investors in our industry is particularly important for a company like ours, which does not yet have any product sales and frequently needs to raise capital through the public markets to support our clinical development plans. In addition, Mr. Barrett's long tenure as Chief Financial Officer and Chief Operating Officer gave him an intimate knowledge of all aspects of our Company. These reasons made Mr. Barrett a valuable resource for us, and this RSU award, with its extended vesting and deferred settlement, was made to Mr. Barrett to ensure his retention as a consultant over a significant period as we continue to grow and develop our HBV-cure and Microbiome programs.

*Other Compensation*

In 2018, we maintained broad-based benefits and perquisites that are provided to all eligible employees on the same terms, including 401(k) match, health insurance, life and disability insurance, dental insurance, sick leave and non-accrual vacation time.

*Other Executive Compensation Policies**Deductibility of Executive Compensation*

Generally, Section 162(m) of the Code disallows a federal income tax deduction for public corporations of remuneration in excess of \$1 million paid for any fiscal year to "covered employees" of the corporation. With respect to taxable years before January 1, 2018, remuneration in excess of \$1 million was exempt from this deduction limit if it qualified as "performance-based compensation" within the meaning of Section 162(m). Through 2017, the Compensation Committee endeavored to structure compensation to maintain deductibility under Section 162(m) of the Code to the extent practicable while maintaining the ability to provide a competitive compensation program for our named executive officers.

The Tax Cuts and Jobs Act of 2017, effective for taxable years beginning after December 31, 2017, (1) expanded the scope of Section 162(m) such that all named executive officers are "covered employees" and anyone who was a named executive officer in any year after 2016 will remain a covered employee for as long as he or she (or his or her beneficiaries) receive compensation from the Company and (2) eliminated the exemption to the deduction limit for commission-based compensation and performance-based compensation except with respect to certain grandfathered arrangements in effect as of November 2, 2017 that are not subsequently materially modified. Accordingly, compensation paid to our named executive officers in excess of \$1 million is not deductible unless it qualifies for the transition relief applicable to certain arrangements in place as of November 2, 2017, as described above.

The Compensation Committee believes that stockholder interests are best served if the Committee retains maximum flexibility to design executive compensation programs that meet stated business objectives. For these reasons, the Compensation Committee, while considering tax deductibility as a factor in determining executive compensation, may not limit such compensation to those levels that will be deductible, particularly considering the expansion of the covered employee group and the elimination of the exception for performance-based compensation.

*Sections 280G and 4999 of the Code*

Sections 280G and 4999 of the Code provide that executive officers and directors who hold significant equity interests and certain other service providers may be subject to significant additional taxes if they receive payments or benefits in connection with a change in control that exceeds certain prescribed limits,

and that we (or a successor) may forfeit a deduction on the amounts subject to this additional tax. We have not agreed to provide any executive officer with a “gross-up” or other reimbursement payment for any tax liability that the executive officer might owe because of the application of Sections 280G or 4999 of the Code.

#### *Hedging and Pledging Policy*

Under our Special Trading Procedures for Insiders, which was adopted as an addendum to our Statement of Company Policy on Insider Trading and Disclosure, directors and executive officers are prohibited from selling our securities “short” at any time. In addition, unless the transaction has been approved by the Audit Committee, directors and executive officers may not at any time pledge our stock as collateral for a loan. None of our NEOs have pledged our stock. The Special Trading Procedures for Insiders prohibits directors and executive officers from (1) buying or selling puts, calls or similar instruments on our securities and (2) engaging in any other hedging transactions with respect to our securities. Directors and executive officers may not hold our stock in a margin account.

#### *Compensation Risk Assessment*

We believe that our executive compensation policies and programs do not encourage excessive or unnecessary risk taking. This is primarily because our compensation programs are designed to encourage our executive officers and other employees to remain focused on both short-term and long-term strategic goals. As a result, we do not believe that our compensation programs are reasonably likely to have a material adverse effect on us.

#### *Clawback*

The Compensation Committee has considered implementing a clawback policy. To date, we have no approved products on the market and have generated no product sales. As a result, our compensation-related goals are not tied to financial metrics and would not be affected by a restatement of our financial statements. Given this and in light of the fact that the SEC has not yet issued final regulations regarding clawback policies under the Dodd-Frank Wall Street Reform and Consumer Protection Act, the Compensation Committee concluded that adopting a clawback policy was premature.

#### *Stock Ownership Guidelines*

The Compensation Committee explored implementing stock ownership guidelines for executive officers and non-employee directors in 2018, but ultimately concluded that all of our executive officers and non-employees hold sufficient equity interests such that any guidelines that would have been implemented would already be met. As a result, no policy on stock ownership guidelines is necessary to protect the interests of the stockholders or to further align the interests of executive officers and non-employee directors with those of our stockholders. The Compensation Committee intends to revisit stock ownership guidelines in the future.

## Summary Compensation Table

The following table sets forth all compensation earned in the fiscal years set forth below by our Named Executive Officers.

Name and Principal Position	Year	Salary (\$) <sup>(1)</sup>	Bonus (\$)	Stock Awards (\$) <sup>(2)</sup>	Option Awards (\$) <sup>(2)</sup>	Non-Equity Incentive Plan Compensation (\$) <sup>(3)</sup>	All Other Compensation (\$) <sup>(10)</sup>	Total (\$)
Derek A. Small <sup>(4)</sup> <i>President and Chief Executive Officer</i>	2018	516,667	—	1,597,050	2,258,020	279,000	95,303	4,746,040
	2017	470,833	—	—	717,892	250,000	—	1,438,725
	2016	445,400	—	—	—	213,750	—	659,150
Graham Cooper <sup>(5)</sup> <i>Chief Financial Officer and Chief Operating Officer</i>	2018	346,266	—	2,419,000	\$8,853,732	157,200	4,050	11,780,248
Richard J. Colonno, Ph.D. <sup>(6)</sup> <i>Executive Vice President and Chief Scientific Officer of Virology Operations</i>	2018	406,900	—	1,220,900	1,042,163	182,000	57,476	2,909,439
	2017	389,500	—	5,313,600	538,419	166,400	—	6,407,919
	2016	377,320	75,000 <sup>(7)</sup>	—	1,055,948	125,000	—	1,633,268
Uri A. Lopatin, M.D. <i>Chief Medical Officer</i>	2018	386,250	—	368,550	521,082	146,400	75,905	1,499,187
	2017	364,167	—	—	224,342	128,700	10,769	728,394
	2016	344,167	—	—	—	116,000	—	460,167
Jacqueline S. Papkoff, Ph.D. <sup>(8)</sup> <i>Senior Vice President, Chief Scientific Officer Microbiome</i>	2018	270,000	—	257,019	\$3,868,084	104,900	10,200	4,510,203
David J. Barrett <sup>(9)</sup> <i>Former Chief Financial Officer and Chief Operating Officer</i>	2018	179,167	—	4,317,000	26,924 <sup>(11)</sup>	—	801,095	5,324,225
	2017	383,017	—	—	448,683	204,600	30,136	1,066,435
	2016	471,001	—	—	—	177,300	30,136	578,437

- (1) These amounts do not match the table under “Compensation Discussion and Analysis — Components of our Executive Compensation Program — Base Salary,” because our NEOs’ salary increases come into effect partway into the fiscal year.
- (2) The reported amounts represent the grant date fair value of the award, computed in accordance with FASB ASC Topic 718 disregarding any estimated forfeitures related to service-based vesting. Assumptions used in the calculation of these amounts are included in Note 7 of the consolidated financial statements included in the Annual Report on Form 10-K for the year ended December 31, 2018.
- (3) Non-equity incentive plan compensation represents amounts paid as annual performance-based cash bonuses. Annual performance-based cash bonuses are paid in the first quarter based on the achievement of Company-wide performance goals and other factors deemed relevant by the Compensation Committee for the prior year.
- (4) Mr. Small is not compensated for his service as a director of the Company.
- (5) On March 8, 2018, Mr. Cooper became an employee of the Company. His annualized base salary for 2018 was \$425,000.
- (6) On January 5, 2016, Dr. Colonno became an employee of the Company. His annualized base salary for 2016 was \$380,000.
- (7) Represents a signing bonus paid to Dr. Colonno in connection with his acceptance of our offer of employment pursuant to the terms of his employment agreement.
- (8) On April 2, 2018, Dr. Papkoff became an employee of the Company. Her annualized base salary for 2018 was \$360,000.
- (9) On March 8, 2018, Mr. Barrett stepped down as Chief Financial Officer and Chief Operating Officer. Mr. Barrett continued as an employee in a strategic advisor role until May 31, 2018 and transitioned to a consulting role effective June 1, 2018. Mr. Barrett received approximately \$230,000 in consulting fees

and \$460,000 in paid or accrued severance pay under his separation agreement, which is reflected in the “All Other Compensation” column. In his role as a strategic advisor, Mr. Barrett worked to ensure a smooth transition of his duties and relationships to Mr. Cooper, including those with our institutional stockholders, with whom Mr. Barrett had developed close relationships. This transition continued following Mr. Barrett’s transition to a consultant. During his first six months as a consultant, Mr. Barrett’s consulting agreement provided for Mr. Barrett to work at least 30 hours per week, which was determined to be more than 50% of his average weekly service level during his last 36 months with us. During the following 12 months, Mr. Barrett is expected to work no more than ten hours per week, which is less than 20% of his average weekly service level during his last 36 months with us. We consider these transition services to be particularly important considering Mr. Barrett’s long tenure with us and our expectation that we will need to raise significant capital money through the public markets as our HBV-cure and Microbiome programs continue to engage in greater numbers of and later stages of clinical studies. Mr. Barrett’s consulting agreement expires on November 30, 2019.

- (10) “All Other Compensation” includes: (a) high deductible health savings account contributions; (b) 401(k) matching contributions made by the Company; (c) payouts for accrued and unused paid time off (PTO); (d) severance payments; and (e) consulting fees paid by the Company. These amounts are detailed in the table below. Payouts for accrued and unused paid time off in 2018 were made as a result of our adoption of a non-accrual based vacation policy.

Name	Year	HSA Contribution	401(k) Match	Accrued and Unused PTO	Severance	Consulting Fees	Total All Other Compensation
Mr. Small	2018	\$ 5,400	\$ 1,583	\$88,320	—	—	\$ 95,303
	2017	—	—	—	—	—	—
	2016	—	—	—	—	—	—
Mr. Cooper	2018	4,050	—	—	—	—	4,050
Dr. Colonno	2018	5,400	12,749	39,327	—	—	57,476
	2017	—	—	—	—	—	—
	2016	—	—	—	—	—	—
Dr. Lopatin	2018	5,400	18,200	53,005	—	—	75,905
	2017	—	—	10,769	—	—	10,769
	2016	—	—	—	—	—	—
Dr. Papkoff	2018	—	10,200	—	—	—	10,200
Mr. Barrett	2018	5,400	14,876	90,822	\$460,000	\$ 230,000	801,095
	2017	—	—	30,136	—	—	30,136
	2016	—	—	30,136	—	—	30,136

- (11) Pursuant to the terms of the separation agreement between Mr. Barrett and the Company, all equity awards held by Mr. Barrett that would have vested within the 12 months following his separation accelerated and became vested and the exercise period for all vested stock options was extended to the end of the term of the applicable stock option. The amount reported represents the incremental fair value of the modified stock option.

### Grants of Plan-Based Awards

The following table provides information for each of our NEOs regarding 2018 annual and long-term incentive award opportunities. Specifically, the table presents the 2018 grants of annual non-equity incentive awards, stock options and restricted stock unit awards. This table does not include annual grants of stock options made in March 2019.

Name	Plan	Grant Date	Estimated Future Payouts Under Non-Equity Incentive Plan Awards Target (\$)	All Other Stock Awards: Number of Shares of Stock or Units (#)	All Other Option Awards: Number of Securities Underlying Options (#)	Exercise of Base Price of Option Awards (\$/Sh)	Grant Date Fair Value of Stock and Option Awards (\$ <sup>(1)</sup> )
Derek A. Small	2018 Bonus Plan	—	262,500	—	—	—	—
	2014 Plan	3/29/2018 <sup>(2)</sup>	—	32,500	—	—	1,597,050
	2014 Plan	3/29/2018 <sup>(3)</sup>	—	—	65,000	49.14	2,258,020
Graham Cooper	2018 Bonus Plan	—	138,507	—	—	—	—
	2017 Plan	3/8/2018 <sup>(4)</sup>	—	—	220,000	57.53	8,853,732
	2018 Plan	12/12/2018 <sup>(5)</sup>	—	100,000	—	—	2,419,000
Richard J. Colonno, Ph.D.	2018 Bonus Plan	—	164,000	—	—	—	—
	2014 Plan	3/29/2018 <sup>(2)</sup>	—	15,000	—	—	737,100
	2014 Plan	3/29/2018 <sup>(3)</sup>	—	—	30,000	49.14	1,042,163
	2018 Plan	12/12/2018 <sup>(6)</sup>	—	20,000	—	—	483,800
Uri A. Lopatin, M.D.	2018 Bonus Plan	—	136,500	—	—	—	—
	2014 Plan	3/29/2018 <sup>(2)</sup>	—	7,500	—	—	368,550
	2014 Plan	3/29/2018 <sup>(3)</sup>	—	—	15,000	49.14	521,082
Jacqueline S. Papkoff, Ph.D.	2018 Bonus Plan	—	94,500	—	—	—	—
	2017 Plan	4/2/2018 <sup>(7)</sup>	—	—	106,200	46.75	3,510,383
	2018 Plan	12/12/2018 <sup>(8)</sup>	—	10,625	—	—	257,019
	2018 Plan	12/12/2018 <sup>(9)</sup>	—	—	21,250	24.19	357,700
David J. Barrett	2014 Plan	6/1/2018 <sup>(10)</sup>	—	100,000	—	—	4,317,000

- (1) The reported amounts represent the grant date fair value of the award, computed in accordance with FASB ASC Topic 718 disregarding any estimated forfeitures related to service-based vesting. Assumptions used in the calculation of these amounts are included in Note 7 of the consolidated financial statements included in our Annual Report on Form 10-K for the year ended December 31, 2018.
- (2) These RSUs vest in four equal installments, assuming continuous service on each vesting date, as follows: March 29, 2019; March 29, 2020; March 29, 2021; and March 29, 2022.
- (3) These stock options vest over four years, assuming continuous service on each vesting date, as follows: 25% shall vest on the first anniversary of the date of grant, March 29, 2019; and the remaining 75% shall vest in 36 equal monthly installments, with the options becoming fully vested on March 29, 2022.
- (4) These stock options vest over three years as follows: one-third will vest on the first anniversary of the date of grant, March 8, 2019; and the remaining two-thirds will vest in 24 equal monthly installments, with the options becoming fully vested on March 8, 2021.
- (5) Assuming continuous service through each vesting date, 50,000 RSUs vest in the following installments: 20,000 RSUs vest on December 12, 2019 and 10,000 RSUs vest on each of June 12, 2020, December 12, 2020 and June 12, 2021. The remaining 50,000 RSUs vest on June 12, 2021, subject to accelerated vesting upon achievement of certain performance milestones, but in no event will such RSUs vest as a result of such performance milestones prior to December 12, 2019.
- (6) These RSUs are fully vested, in accordance with the terms of Dr. Colonno's 2017 RSU award agreement.

- (7) These stock options vest over four years, assuming continuous service on each vesting date, as follows: 25% shall vest on the first anniversary of the date of grant, April 2, 2019; and the remaining 75% shall vest in 36 equal monthly installments, with the options becoming fully vested on April 2, 2022.
- (8) These RSUs vest in approximately equal annual installments, assuming continuous service on each vesting date, on the first, second and third anniversaries of the date of grant.
- (9) These stock options vest in approximately equal annual installments, assuming continuous service on each vesting date, on the first, second and third anniversaries of the date of grant.
- (10) Subject to Mr. Barrett's continuous service to the Company under the Consulting Agreement, the RSUs will vest in six equal quarterly installments beginning on August 31, 2018, with the RSUs becoming fully vested on November 30, 2019. Vested RSUs will be settled in three approximately equal installments on January 15, 2019, July 15, 2019 and January 15, 2020. If a change in control of the Company occurs prior to the last settlement date, all RSUs that have not settled as of such date shall be settled.

### Outstanding Equity Awards at December 31, 2018

The following table contains certain information concerning outstanding equity awards held by the NEOs as of December 31, 2018.

Name	Option Awards				Stock Awards			
	Number of Securities Underlying Unexercised Options (#) Exercisable	Number of Securities Underlying Unexercised Options (#) Unexercisable	Option Exercise Price (\$)	Option Expiration Date	Number of Shares or Units of Stock That Have Not Vested (#)	Market Value of Shares or Units of Stock That Have Not Vested (\$)	Equity Incentive Plan Awards: Number of Unearned Shares, Units or Other Rights That Have Not Vested (#)	Equity Incentive Plan Awards: Market or Payout Value of Unearned Shares, Units or Other Rights That Have Not Vested (\$)
Derek A. Small	466,238	—	2.22	5/15/2024	—	—	—	—
	35,000	5,000 <sup>(1)</sup>	25.34	3/29/2027	—	—	—	—
	—	65,000 <sup>(2)</sup>	49.14	3/29/2028	—	—	—	—
	—	—	—	—	32,500 <sup>(3)</sup>	735,150	—	—
Graham Cooper	—	220,000 <sup>(4)</sup>	57.53	3/8/2028	—	—	—	—
	—	—	—	—	100,000 <sup>(5)</sup>	2,262,000	—	—
Richard J. Colonno, Ph.D.	100,000 <sup>(4)</sup>	100,000 <sup>(6)</sup>	7.03	1/11/2026	—	—	—	—
	26,250 <sup>(1)</sup>	3,750 <sup>(1)</sup>	25.34	3/29/2027	—	—	—	—
	—	30,000 <sup>(2)</sup>	49.14	3/29/2028	—	—	—	—
	—	—	—	—	—	—	45,000 <sup>(7)</sup>	1,017,900
	—	—	—	—	15,000 <sup>(3)</sup>	339,300	—	—
Uri A. Lopatin, M.D.	160,000	—	7.20	7/10/2024	—	—	—	—
	10,937	1,563 <sup>(1)</sup>	25.34	3/29/2027	—	—	—	—
	—	15,000 <sup>(2)</sup>	49.14	3/29/2028	—	—	—	—
	—	—	—	—	7,500 <sup>(3)</sup>	169,650	—	—
Jacqueline S. Papkoff, Ph.D.	—	106,200 <sup>(2)</sup>	46.75	4/2/2028	—	—	—	—
	—	21,250 <sup>(8)</sup>	24.19	12/12/2028	—	—	—	—
	—	—	—	—	10,625 <sup>(8)</sup>	240,338	—	—
David J. Barrett	459,942	—	7.20	7/11/2024	—	—	—	—
	25,000	—	25.34	3/29/2027	—	—	—	—
	—	—	—	—	66,668 <sup>(9)</sup>	1,508,030	—	—

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- (1) These options vest and become exercisable 50% on the first anniversary of the grant date and the remainder over the next 12 months in approximately equal installments provided that the executive officer continues to be employed with the Company through the applicable vesting date. The vesting is subject to acceleration in connection with certain terminations of service.
  - (2) These options vest and become exercisable 25% on the first anniversary of the grant date and the remainder over the next 36 months in approximately equal monthly installments provided that the executive officer continues to be employed with the Company through the applicable vesting date. The vesting is subject to acceleration in connection with certain terminations of service.
  - (3) The RSUs vest in four approximately equal installments on March 29, 2019, March 29, 2020, March 20, 2021 and March 20, 2022 provided that the executive officer continues to be employed with the Company through the applicable vesting date. The vesting is subject to acceleration in connection with certain terminations of service.
  - (4) This option vests and becomes exercisable one-third on the first anniversary of the grant date and the remainder over the next twenty-four months in approximately equal monthly installments provided that the executive officer continues to be employed with the Company through the applicable vesting date. The vesting is subject to acceleration in connection with certain terminations of service.
  - (5) These RSUs vest as follows: (a) 50,000 RSUs shall vest in accordance with the following schedule: 20,000 on December 12, 2019; 10,000 on June 12, 2020; 10,000 on December 12, 2020 and 10,000 on June 12, 2021 and (b) 50,000 RSUs shall vest on June 12, 2021 subject to acceleration of such vesting date upon the achievement of certain performance milestones as determined by the Chief Executive Officer and Board of Directors provided that in no event may such RSUs be accelerated to a date prior to December 12, 2019. In each case such vesting is subject to the executive officer's continuation of service through the vesting date. The vesting is subject to acceleration in connection with certain terminations of service. Vested RSUs are subject to a deferred settlement on the earlier of a separation of service, change of control and six months following vesting.
  - (6) This option vests and becomes exercisable in four equal annual installments from January 5, 2016, such that assuming continuous service the option shall be fully vested and exercisable on January 5, 2020 provided that the executive officer continues to be employed with the Company through the applicable vesting date. The vesting is subject to acceleration in connection with certain terminations of service.
  - (7) Reflects performance-based restricted stock units granted on December 8, 2017 that vest upon the occurrence of certain milestones that relate to advancement of our HBV-cure program and its product candidates, which, if disclosed, would put us at a competitive disadvantage. As of December 31, 2018, 75,000 RSUs have vested and 45,000 RSUs remain subject to performance-based milestone vesting. Vested RSUs are subject to a deferred settlement of the earlier of a separation of service, change of control and March 1, 2023.
  - (8) These equity awards vest and become exercisable in three equal annual installments from the grant date, such that assuming continuous service the equity awards shall be fully vested and exercisable on December 12, 2021 provided that the executive officer continues to be employed with the Company through the applicable vesting date. The vesting is subject to acceleration in connection with certain terminations of service.
  - (9) These RSUs vest in six approximately equal quarterly installments commencing on August 31, 2018, provided that Mr. Barrett continues to perform services for the Company under his consulting agreement through the applicable vesting date. Vested RSUs will be settled in three approximately equal installments on January 15, 2019, July 15, 2019 and January 15, 2020 or if earlier upon the occurrence of a corporate transaction (as defined in the 2014 Plan).



### Option Exercises and Stock Vested

The following table presents, for each of the NEOs, the shares of our common stock acquired upon the exercise of stock options and vesting of RSUs and the related value realized during the fiscal year ended December 31, 2018.

Name	Option Awards		Stock Awards	
	Number of Shares Acquired on Exercise (#)	Value Realized on Exercise <sup>(1)</sup> (\$)	Number of Shares Acquired on Vesting (#)	Value Realized on Vesting <sup>(2)</sup> (\$)
Derek A. Small	—	—	—	—
Graham Cooper	—	—	—	—
Richard J. Colonno, Ph.D.	—	—	95,000 <sup>(3)</sup>	3,577,550
Uri A. Lopatin, M.D.	—	—	—	—
Jacqueline S. Papkoff, Ph.D.	—	—	—	—
David J. Barrett	241,664 <sup>(4)</sup>	10,260,848	33,332 <sup>(5)</sup>	1,096,290

- (1) Value realized on exercise of stock option awards does not represent proceeds from any sale of any common stock acquired upon exercise, but is determined by multiplying the number of shares acquired upon exercise by the difference between the per share exercise price of the option and the closing price of a share of our common stock on the Nasdaq Capital Market on the date of exercise.
- (2) The value realized on vesting is based on the closing market price per share of our common stock on the Nasdaq Capital Market on the vesting date, multiplied by the number of RSUs that vested.
- (3) In December 2017, Dr. Colonno was granted 120,000 RSUs subject to performance milestones and a potential grant of an additional 20,000 RSUs upon achievement of certain milestones that relate to advancement of our HBV-cure program and its product candidates, which, if disclosed, would put us at a competitive disadvantage. During 2018, Dr. Colonno met the performance milestones for 75,000 RSUs under this grant and was granted the contingent award of 20,000 RSUs in December 2018. All of Dr. Colonno's vested RSUs are subject to a deferred settlement based upon the earliest of a separation of service, change of control and March 1, 2023.
- (4) In July 2014, Mr. Barrett was granted a compensatory stock option for 741,800 shares of Common Stock with an exercise price of \$7.20 per share. In 2018, Mr. Barrett (a) paid cash to exercise 41,664 options and (b) was issued a net of 200,000 shares through a net exercise of 240,194 options. The remaining 459,942 options remain outstanding unless exercised until July 2024.
- (5) Mr. Barrett's RSUs that vested in 2018 were subject to deferred settlement and settled on January 15, 2019.

### Pension Benefits

We do not maintain any qualified or non-qualified defined benefit pension plans. As a result, none of our NEOs participates in or has account balances in qualified or non-qualified defined benefit plans sponsored by us.

### Nonqualified Deferred Compensation

The following table represents nonqualified deferred compensation held by NEOs as of December 31, 2018, which consists of RSUs subject to deferred settlement as described above under “— Option Exercises and Stock Vested.”

Name	Executive Contributions in Last FY (\$)	Aggregate Balance at Last FYE (\$)
Derek A. Small	—	—
Graham Cooper	—	—
Richard J. Colonno, Ph.D.	3,577,550	3,577,550
Uri A. Lopatin, M.D.	—	—
Jacqueline S. Papkoff, Ph.D.	—	—
David J. Barrett	1,096,290	1,096,290

### Employment Arrangements

All of our NEOs serve pursuant to an employment agreement other than Mr. Barrett, whose employment with us terminated on May 30, 2018. At the time of the termination of his employment, Mr. Barrett entered into a separation agreement.

#### *Derek A. Small*

In connection with the Merger in July 2014, we entered into an employment agreement with Mr. Small, which was amended in October 2018. Mr. Small’s employment agreement provides for an at-will employment arrangement. Mr. Small’s base salary in 2018 was \$525,000 (effective as of March 1) and his annual performance-based cash bonus was targeted at 50% of his base salary. In February 2019, Mr. Small’s annual base salary was increased to \$562,000, and his annual performance-based cash bonus target was increased to 55% of his base salary.

We have agreed to use our best efforts to cause Mr. Small to be elected as a voting member of the Board throughout his employment and shall include him in the slate for election as a director at every stockholders’ meeting at which his term as a director would otherwise expire while he remains an employee. Mr. Small has agreed to accept such election and to serve as a member of the Board without any additional compensation while he remains an employee.

In the event Mr. Small is required to relocate from Indianapolis, Indiana, we shall, for each of the first three 12-month periods following our decision regarding Mr. Small’s relocation, reimburse or pay to Mr. Small up to \$120,000 in cash for expenses incurred by Mr. Small to maintain a separate apartment in or near the city in which our principal executive offices are located and to assist with commuting expenses to and from such principal executive offices.

If Mr. Small’s employment is terminated due to his death, then we will pay to his estate his then-current base salary for a period of 12 months following such termination.

If Mr. Small’s employment is terminated by us without cause (as defined in his employment agreement) or by Mr. Small for good reason (as defined in his employment agreement) within 12 months following a change of control (as defined in his employment agreement), and provided that Mr. Small signs and does not revoke a general release of claims against us, we will provide Mr. Small the following benefits: (1) a lump sum payment equal to 18 months of his then current base salary; (2) an amount equal to 1.5 times his target annual bonus; (3) immediate vesting in full of all equity awards held by Mr. Small; (4) extension of the exercise period for all stock options held by Mr. Small to the end of their term; and (5) if Mr. Small properly elects COBRA, reimbursement of COBRA premiums for 18 months following termination or until the end of his COBRA continuation period, whichever is earlier; provided, however, our obligation to pay such premiums will terminate earlier if he becomes eligible for insurance benefits from another employer during such period.

If Mr. Small's employment is terminated as a result of his disability (as defined in the employment agreement), by us without cause, or by Mr. Small for good reason, in each case other than within 12 months following a change of control, and provided that Mr. Small signs and does not revoke a general release of claims against us, we will provide him the following benefits: (1) continued payment of his then base salary for 12 months following the date of termination of employment, (2) immediate vesting in full of all equity awards held by Mr. Small that would have become vested during the 12 months following termination of employment, (3) extension of the exercise period for all vested stock options held by Mr. Small to the end of their term, and (4) if Mr. Small properly elects COBRA, reimbursement of his COBRA premiums for 12 months following termination or the end of his COBRA continuation period, whichever is earlier; provided, however our obligation to pay such premiums will terminate earlier if he becomes eligible for insurance benefits from another employer during such period. Such benefits are in lieu of, and not in addition to, the benefits described in the preceding paragraph.

Mr. Small's employment agreement includes non-solicitation and non-competition covenants that apply during his employment and for one year following the termination of his employment.

#### *Graham Cooper*

In March 2018, we entered into an employment agreement with Mr. Cooper. The employment agreement provides for an at-will employment arrangement. Mr. Cooper's employment agreement provides for an initial annual base salary of \$425,000 and an annual performance-based incentive cash bonus in an amount initially targeted at 40% of Mr. Cooper's base salary. In February 2019, Mr. Cooper's annual base salary was increased to \$445,000, and his target bonus opportunity remained unchanged.

If Mr. Cooper's employment is terminated due to his death, then we will pay to his estate his then-current base salary for a period of 12 months following such termination.

If Mr. Cooper's employment is terminated by us for disability (as defined in his employment agreement) or without cause (as defined in his employment agreement) or by Mr. Cooper for good reason (as defined in his employment agreement) or as a result of his death within one month prior to or within 12 months following, a change of control (as defined in his employment agreement), and provided that Mr. Cooper signs and does not revoke a general release of claims against us, we will provide Mr. Cooper the following benefits: (1) a lump sum payment equal to 18 months of his then-current base salary; (2) an amount equal to 1.5 times his target annual bonus for the year in which the termination occurred; (3) immediate vesting in full of all equity awards held by Mr. Cooper; provided, however that (a) in the event that such termination occurs during the one month prior to a change of control, any equity-based compensation outstanding as of the termination will not accelerate but will remain outstanding and eligible to vest immediately prior to the consummation of the change of control and (b) in the event that such termination occurs prior to a change of control and such change of control is not consummated on or prior to the date one month after such termination, no vesting will occur and any equity awards outstanding as of the termination will terminate in accordance with its terms; (4) extension of the exercise period for all vested stock options held by Mr. Cooper to the end of their term; and (5) if Mr. Cooper properly elects COBRA, reimbursement of COBRA premiums for 18 months following termination or the end of his COBRA continuation period, whichever is earlier; provided, however, our obligation to pay such premiums will terminate earlier if he becomes eligible for insurance benefits from another employer during such period.

If Mr. Cooper's employment is terminated as a result of his disability, by us without cause or by Mr. Cooper for good reason, and such termination does not occur during the one month prior to or within 12 months following, a change of control and provided that Mr. Cooper signs and does not revoke a general release of claims against us, we will provide him the following benefits: (1) continued payment of his then-current base salary for 12 months following date of termination of employment; (2) all equity awards which would have time vested during the 12 months following the termination date shall accelerate and vest; (3) extension of the exercise period for all vested stock options held by Mr. Cooper as of the termination date until the first anniversary of the termination date; (4) if Mr. Cooper properly elects COBRA, reimbursement of COBRA premiums for 12 months following termination or the end of his COBRA

continuation period, whichever is earlier; provided, however, our obligation to pay such premiums will terminate earlier if he becomes eligible for insurance benefits from another employer during such period. Such benefits are in lieu of, and not in addition to, the benefits described in the preceding paragraph.

Mr. Cooper's employment agreement includes non-solicitation covenants that apply during his employment and for one year following the termination of his employment.

*Richard J. Colonno, Ph.D.*

In December 2015, we entered into an employment agreement with Dr. Colonno, which became effective in January 2016. Dr. Colonno's employment agreement was amended in October 2018. Dr. Colonno's employment agreement provides for an at-will employment arrangement. Dr. Colonno's base salary in 2018 was \$410,000 (effective as of March 1), and his annual performance-based cash bonus was targeted at 40% of his base salary. In February 2019, Dr. Colonno's annual base salary was increased to \$430,00, and his annual performance-based cash bonus target remained unchanged.

If Dr. Colonno's employment is terminated due to his death, then we will pay to his estate his then-current base salary for a period of 12 months following such termination.

If Dr. Colonno's employment is terminated by us for disability (as defined in his employment agreement) or without cause (as defined in his employment agreement) or by Dr. Colonno for good reason (as defined in his employment agreement) within 12 months following a change of control (as defined in his employment agreement), and provided that Dr. Colonno signs and does not revoke a general release of claims against us, we will provide Dr. Colonno the following benefits: (1) a lump sum payment equal to 18 months of his then current base salary; (2) an amount equal to his target annual bonus; (3) immediate vesting in full of all equity awards held by Dr. Colonno; (4) extension of the exercise period for all stock options held by Dr. Colonno to the end of their term; and (5) if Dr. Colonno properly elects COBRA, reimbursement of COBRA premiums for 18 months following termination or the end of his COBRA continuation period, whichever is earlier; provided, however, our obligation to pay such premiums will terminate earlier if he becomes eligible for insurance benefits from another employer during such period.

If Dr. Colonno's employment is terminated as a result of his disability (as defined in his employment agreement), by us without cause, or by Dr. Colonno for good reason, in each case other than within 12 months following a change of control, and provided that Dr. Colonno signs and does not revoke a general release of claims against us, we will provide him the following benefits: (1) continued payment of his then base salary for 12 months following date of termination of employment, (2) immediate vesting in full of all equity awards held by Dr. Colonno that would have become vested during the 12 months following termination of employment, (3) extension of the exercise period for all vested stock options held by Dr. Colonno to the end of their term, and (4) if Dr. Colonno properly elects COBRA, reimbursement of COBRA premiums for 12 months following termination or the end of his COBRA continuation period, whichever is earlier; provided, however, our obligation to pay such premiums will terminate earlier if he becomes eligible for insurance benefits from another employer during such period. Such benefits are in lieu of, and not in addition to, the benefits described in the preceding paragraph.

Dr. Colonno's employment agreement includes non-solicitation covenants that apply during his employment and for one year following the termination of his employment.

*Uri A. Lopatin, M.D.*

In October 2018, we entered into an amended and restated employment agreement with Dr. Lopatin. Dr. Lopatin's employment agreement provides for an at-will employment arrangement. Dr. Lopatin's base salary in 2018 was \$390,000 (effective as of March 1), and his annual performance-based cash bonus was targeted at 35% of his base salary. In February 2019, Dr. Lopatin's annual base salary was increased to \$410,000, and his annual performance-based cash bonus target was increased to 40% of his annualized base salary.

If Dr. Lopatin's employment is terminated due to his death, then the Company will pay to his estate his then-current base salary for a period of 12 months following such termination.

If Dr. Lopatin's employment is terminated by us for disability (as defined in the employment agreement) or without cause (as defined in his employment agreement) or by Dr. Lopatin for good reason (as defined in his employment agreement) within 12 months following a change of control, and provided that Dr. Lopatin signs and does not revoke a general release of claims against us, we will provide Dr. Lopatin the following benefits: (1) a lump sum payment equal to 12 months of his then-current base salary; (2) an amount equal to his full target annual bonus; (3) immediate vesting in full of all equity awards held by Dr. Lopatin subject to time-based vesting; (4) extension of the exercise period for all vested stock options held by Dr. Lopatin to the end of their term; and (5) if Dr. Lopatin properly elects COBRA, reimbursement of COBRA premiums for 12 months following termination or the end of his COBRA continuation period, whichever is earlier; provided, however, our obligation to pay such premiums will terminate earlier if he becomes eligible for health insurance benefits from another employer during such period.

If Dr. Lopatin's employment is terminated by us as a result of his disability or without cause or by Dr. Lopatin for certain good reasons, and such termination does not occur within 12 months following a change of control, and provided that Dr. Lopatin signs and does not revoke a general release of claims against us, we will provide him the following benefits: (1) continued payment of his then-current base salary for 12 months; (2) immediate vesting in full of all equity awards that would have become vested during the six months following termination of employment; (3) with respect to Dr. Lopatin's vested stock options, (a) the extension of the exercise period for all vested stock options granted prior to 2018 until term and (b) the extension of the exercise period for all vested stock options granted after January 2018 until the first anniversary of the termination date; and (4) if Dr. Lopatin properly elects COBRA, reimbursement of COBRA premiums for 12 months following termination or the end of his COBRA continuation period, whichever is earlier; provided, however, our obligation to pay such premiums will terminate earlier if he becomes eligible for health insurance benefits from another employer during such period. Such benefits are in lieu of, and not in addition to, the benefits described in the preceding paragraph.

Dr. Lopatin's employment agreement includes non-solicitation covenants that apply during his employment and for one year following the termination of his employment.

*Jacqueline S. Papkoff, Ph.D.*

In October 2018, we entered into an amended and restated employment agreement with Dr. Papkoff. Dr. Papkoff's employment agreement provides for an at-will employment arrangement. The employment agreement provides for an initial annual base salary of \$360,000 and an annual performance-based cash bonus targeted at 35% of Dr. Papkoff's base salary. In February 2019, Dr. Papkoff's annual base salary was increased to \$400,000, and her annual performance-based cash bonus target was increased to 40% of her annualized base salary.

If Dr. Papkoff's employment is terminated due to her death, then the Company will pay to her estate her then-current base salary for a period of 12 months following such termination.

If Dr. Papkoff's employment is terminated by us for disability (as defined in the employment agreement) or without cause or by Dr. Papkoff for good reason within 12 months following a change of control, and provided that Dr. Papkoff signs and does not revoke a general release of claims against us, we will provide Dr. Papkoff the following benefits: (1) a lump sum payment equal to 12 months of her then-current base salary; (2) an amount equal to her full target annual bonus; (3) immediate vesting in full of all equity awards held by Dr. Papkoff subject to time-based vesting; (4) extension of the exercise period for all vested stock options held by Dr. Papkoff to the end of their term; and (5) if Dr. Papkoff properly elects COBRA, reimbursement of COBRA premiums for 12 months following termination or the end of her COBRA continuation period, whichever is earlier; provided, however, our obligation to pay such premiums will terminate earlier if she becomes eligible for health insurance benefits from another employer during such period.

If Dr. Papkoff's employment is terminated as a result of her disability, by us without cause or by Dr. Papkoff for good reason, and such termination does not occur within 12 months following a change of control, and provided that Dr. Papkoff signs and does not revoke a general release of claims against us, we will provide her the following benefits: (1) continued payment of her then-current base salary for 12 months

and (2) if Dr. Papkoff properly elects COBRA, reimbursement of COBRA premiums for 12 months following termination or the end of her COBRA continuation period, whichever is earlier; provided, however, our obligation to pay such premiums will terminate earlier if she becomes eligible for health insurance benefits from another employer during such period. Such benefits are in lieu of, and not in addition to, the benefits described in the preceding paragraph.

Dr. Papkoff's employment agreement includes non-solicitation covenants that apply during her employment and for one year following the termination of her employment.

#### *Separation Agreement with David Barrett*

Effective June 2018, we entered into a separation agreement with Mr. Barrett. Under the terms of the separation agreement, Mr. Barrett is entitled to receive the following benefits: (1) continued payment of his final base salary, which is an annualized rate of \$460,000, for 12 months following his separation of service; (2) immediate acceleration of vesting, as of the date of his termination of employment, of all equity awards held by Mr. Barrett that would have become vested during the 12 months following such date; (3) extension of the exercise period for all vested stock options held by Mr. Barrett to the end of their term (generally ten years from their grant date); and (4) if Mr. Barrett properly elects COBRA, reimbursement of COBRA premiums for 18 months following his termination of employment or until Mr. Barrett becomes eligible to receive benefits under another employer's health insurance.

#### **Potential Payments Upon Employment Termination or Change of Control**

The information below describes and quantifies certain compensation that would have become payable under employment agreements with our NEOs if their employment with us had been terminated as of December 31, 2018. Due to the number of factors that affect the nature and amount of any benefits provided upon the events discussed below, any actual amounts paid or distributed upon a termination or change of control may be different. Factors that could affect these amounts include the timing during the year of any such event.

Name	Termination Without Cause Other Than Within 12 Months Following a Change of Control (\$)	Termination for Good Reason by Executive Other Than Within 12 Months Following Change of Control (\$)	Disability (\$)	Death (\$)	Termination Without Cause, Disability or for Good Reason Within 12 Months Following a Change of Control (\$)
<b>Derek A. Small</b>					
Cash Severance	525,000	525,000	525,000	525,000	1,181,250
Continuation of Benefits	21,436	21,436	21,436	—	32,153
Equity Acceleration <sup>(1)</sup>	183,787	183,787	183,787	—	735,150
<b>Graham Cooper</b>					
Cash Severance	425,000	425,000	425,000	425,000	892,500 <sup>(3)</sup>
Continuation of Benefits	21,436	21,436	21,436	—	32,153
Equity Acceleration <sup>(1)</sup>	565,500	565,000	565,500	—	2,262,000
<b>Richard J. Colonno, Ph.D.</b>					
Cash Severance	410,000	410,000	410,000	410,000	779,000
Continuation of Benefits	14,892	14,892	14,892	—	22,338
Equity Acceleration <sup>(1)</sup>	864,325	864,325	864,325	—	2,916,200

Name	Termination Without Cause Other Than Within 12 Months Following a Change of Control (\$)	Termination for Good Reason by Executive Other Than Within 12 Months Following a Change of Control (\$)	Disability (\$)	Death (\$)	Termination Without Cause, Disability or for Good Reason Within 12 Months Following a Change of Control (\$)
<b>Uri A. Lopatin, M.D.</b>					
Cash Severance	390,000	390,000	390,000	390,000	526,500
Continuation of Benefits	21,436	21,436	21,436	—	21,436
Equity Acceleration <sup>(1)</sup>	42,413	42,413	42,413	—	169,650
<b>Jacqueline S. Papkoff, Ph.D.</b>					
Cash Severance	360,000	360,000	360,000	390,000	486,000
Continuation of Benefits	10,548	10,548	10,548	—	10,548
Equity Acceleration <sup>(1)</sup>	—	—	—	—	240,338
<b>David J. Barrett<sup>(2)</sup></b>					
Cash Severance	421,667	—	—	—	—
Continuation of Benefits	19,649	—	—	—	—
Equity Acceleration <sup>(1)</sup>	—	—	—	—	1,508,030

- (1) Reflects the accelerated value of all outstanding equity awards that would accelerate on the closing price of our stock on the Nasdaq Capital Market on December 31, 2018, the last trading day of the year, which was \$22.62 per share. This represents the in-the-money value of accelerated stock options as of December 31, 2018.
- (2) Mr. Barrett ceased being an employee on May 31, 2018 and transitioned to be a consultant as of June 1, 2018. Amounts reflected for Mr. Barrett reflect the actual amounts of severance and COBRA benefits under his contractual arrangements. Equity acceleration relates to the acceleration of vesting of equity awards pursuant to his separation agreement.
- (3) Mr. Cooper's change of control protected period is one month prior to a change of control and 12 months following a change of control. Mr. Cooper is also entitled to the change of control benefits in the event of his death during the change of control protected period.

#### Compensation Committee Report

The Compensation Committee has reviewed and discussed the Compensation Discussion and Analysis with management. Based on this review and discussion, the Compensation Committee recommended to the Board of Directors that the Compensation Discussion and Analysis be included in this proxy statement.

Submitted by:           The Compensation Committee  
Myron Z. Holubiak, Chairman  
Mark Auerbach  
Susan Mahony, Ph.D.  
William R. Ringo, Jr.

## CEO Pay Ratio

As required by Section 953(b) of the Dodd-Frank Wall Street Reform and Consumer Protection Act and Item 402(u) of Regulation S-K, and the guidance thereunder, we determined the ratio of the annual total compensation of Mr. Small relative to the annual total compensation of our median employee.

For purposes of reporting annual total compensation and the ratio of annual total compensation of the CEO to that of our median employee, both the CEO and median employee's annual total compensation were calculated consistently with the disclosure requirement of executive compensation under the Summary Compensation Table.

Due to various factors, including the increase in the number of our employees, we redetermined our median employee. To determine our median employee for all employees other than our Chief Executive Officer who were employed by us as of December 31, 2018, we used the following consistently applied compensation method: base salary (annualized in the case of employees who joined the Company on or after January 1, 2018 or who took an unpaid leave of absence for any period during 2018) plus target performance-based cash bonus. We identified a new median employee for 2018 because the median employee used for the 2017 pay ratio is no longer with the Company and due to a significant increase in our employee population that occurred in 2018. In accordance with Item 402(u) and the instructions thereto, we included all full-time, part-time and temporary employees. We do not have any seasonal employees. We have excluded employees outside of the United States, because they represented less than 5% of our employees. We believe our consistently applied compensation method reasonably reflects the total annual compensation of our employees. To determine the annual total compensation of our median employee, we used our consistently applied compensation method and included the grant date fair value of any equity awards received in 2018, computed in accordance with FASB ASC Topic 718, because we widely distribute annual equity awards to employees.

After applying the methodology described above, our estimated median employee compensation was \$276,726. Our CEO's compensation in the Summary Compensation Table was \$4,746,040. Therefore, our CEO to median employee pay ratio is estimated to be 17.2 to 1. This CEO to median employee pay ratio reflects our reasonable good faith estimate of such ratio. The significant increase in compensation levels for both the median employee and the CEO year over year was due to an increase in our share price and the granting of larger equity awards that vest over a four-year vesting period rather than a two-year vesting period.

This information is being provided for compliance purposes and is a reasonable estimate calculated in a manner consistent with SEC rules, based on our internal records and the methodology described above. The SEC rules for identifying the median compensated employee allow companies to adopt a variety of methodologies, to apply certain exclusions and to make reasonable estimates and assumptions that reflect their employee populations and compensation practices. Accordingly, the pay ratio reported by other companies may not be comparable to the pay ratio reported above, as other companies have different employee populations and compensation practices and may use different methodologies, exclusions, estimates and assumptions in calculating their own pay ratios. Neither the Compensation Committee nor management of the Company used the CEO Pay Ratio measure in making compensation decisions.

## Compensation Committee Interlocks and Insider Participation

Messrs. Holubiak, Auerbach and Ringo and Dr. Mahony served as members of our Compensation Committee during the year ended December 31, 2018. No member of our Compensation Committee has ever been an executive officer or employee of us or any of our subsidiaries. None of our executive officers currently serves, or has served during the last completed fiscal year, on the compensation committee or board of directors of any other entity that has one or more executive officers serving as a member of the Board or Compensation Committee. During 2018, no members of our Compensation Committee had any relationships requiring disclosure by us under the SEC's rules requiring disclosure of certain relationships and related party transactions.



**CERTAIN RELATIONSHIPS AND RELATED PARTY TRANSACTIONS**

The written charter of our Audit Committee authorizes, and the Nasdaq listing rules require, our Audit Committee to review and approve related party transactions. In reviewing related party transactions, our Audit Committee applies the basic standard that transactions with affiliates should be made on terms no less favorable to us than could have been obtained from unaffiliated parties. Therefore, the Audit Committee reviews the benefits of the transactions, terms of the transactions and the terms available from unrelated third parties, as applicable. All transactions other than compensatory arrangements between us and our officers, directors, principal stockholders and their affiliates will be approved or ratified by our Audit Committee or a majority of the disinterested directors and will continue to be on terms no less favorable to us than could be obtained from unaffiliated third parties.

Other than the compensation agreements and other arrangements described under “Executive Compensation — Employment Arrangements” since January 1, 2018, there has not been and there is not currently proposed, any transaction or series of similar transactions to which we were, or will be, a party in which the amount involved exceeded, or will exceed, \$120,000 and in which any director, executive officer, holder of five percent or more of any class of our capital stock or any member of the immediate family of, or entities affiliated with, any of the foregoing persons, had, or will have, a direct or indirect material interest.

## SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT

### Principal Stockholders

The following table sets forth certain information regarding the ownership of shares of our common stock based on 25,549,757 shares outstanding as of March 22, 2019 (the “Table Date”) by (1) each person known by us to beneficially own more than 5% of the outstanding shares of common stock, (2) each of our directors, (3) each of our NEOs and (4) all of our directors and current executive officers as a group.

This table is based upon information supplied by our directors and NEOs and from Schedules 13G filed with the SEC by our 5% stockholders. Unless otherwise indicated in the footnotes to this table and subject to community property laws where applicable, each of the stockholders named in this table has sole voting and investment power with respect to the shares indicated as beneficially owned by them, subject to community property laws, where applicable. Share ownership in each case includes (1) shares issuable upon exercise of options and warrants that may be exercised within 60 days after the Table Date and (2) RSUs held by the individual that are scheduled to vest and settle within 60 days after the Table Date for purposes of computing the percentage of common stock owned by such person, but not for purposes of computing the percentage owned by any other person. Unless otherwise noted, the address for each person listed below is c/o Assembly Biosciences, Inc., 11711 N. Meridian Street, Suite 310, Carmel, Indiana 46032. Applicable percentages are based on 25,549,757 shares outstanding on the Table Date.

There are no arrangements, known to Assembly, including any pledge by any person of securities of Assembly, the operation of which may at a subsequent date result in a change in control of Assembly.

Name of Beneficial Owner	Shares Beneficially Owned	Percentage Owned (%)
<b>5% Stockholders:</b>		
Jennison Associates LLC <sup>(1)</sup> 466 Lexington Avenue New York, NY 10017	2,478,639	9.7%
EcoR1 Capital, LLC <sup>(2)</sup> 409 Illinois Street San Francisco, CA 94158	2,404,853	9.4%
Wellington Management Group LLP, <sup>(3)</sup> Wellington Group Holdings LLP, Wellington Investment Advisors Holdings LLP, Wellington Management Company LLP c/o Wellington Management Company LLP 280 Congress Street Boston, MA 02210	2,316,457	9.1%
BlackRock Inc. <sup>(4)</sup> 55 East 52nd Street New York, NY 10055	1,909,510	7.5%
<b>Directors, Named Executive Officers and Executive Officers:</b>		
Anthony E. Altig <sup>(5)</sup>	107,000	*
Mark Auerbach <sup>(6)</sup>	99,000	*
Richard D. DiMarchi, Ph.D. <sup>(7)</sup>	418,240	1.6%
Myron Z. Holubiak <sup>(6)</sup>	99,000	*
Helen S. Kim <sup>(6)</sup>	14,167	*
Susan Mahony, Ph.D. <sup>(6)</sup>	14,167	*
Alan J. Lewis, Ph.D. <sup>(6)</sup>	55,000	*
William R. Ringo, Jr. <sup>(8)</sup>	103,465	*
Derek A. Small <sup>(9)</sup>	1,166,358	4.6%

Name of Beneficial Owner	Shares Beneficially Owned	Percentage Owned (%)
Richard J. Colonno, Ph.D. <sup>(10)</sup>	191,875	*
Graham Cooper <sup>(11)</sup>	85,556	*
Uri A. Lopatin, M.D. <sup>(12)</sup>	789,549	3.1%
Jacqueline S. Papkoff, Ph.D. <sup>(13)</sup>	28,763	*
David J. Barrett <sup>(14)</sup>	1,369,940	5.4%
All directors and current executive officers as a group (13 persons) <sup>(15)</sup>	<u>3,172,139</u>	12.42%

\* Less than 1%.

- (1) Based on the information contained in the Schedule 13G/A filed with the SEC on January 31, 2019 by Prudential Financial, Inc. (the Prudential 13G/A) and the Schedule 13G/A filed with the SEC on January 31, 2019 by Jennison Associates, LLC (the Jennison 13G/A). According to the Prudential 13G/A, as of December 31, 2018, Prudential Financial, Inc. holds sole voting and dispositive power over 1,550 shares of common stock, shared voting and dispositive power over 2,477,089 shares of common stock, and through its subsidiaries, including indirect ownership of 100% of the equity interest in Jennison Associates, LLC, Prudential Financial, Inc. may be deemed to be the beneficial owner of an aggregate amount of 2,478,639 shares of common stock, of which 2,476,190 shares (9.72%) are held by Jennison Associates, LLC. According to the Jennison 13G/A, as of December 31, 2018, Jennison Associates, LLC has sole voting power over 2,476,190 of the shares of common stock and shared dispositive power over 2,476,190 of the shares of common stock.
- (2) Based on the information contained in the Schedule 13G/A filed with the SEC on February 14, 2019 by EcoR1 Capital, LLC, Oleg Nodelman, and EcoR1 Capital Fund Qualified, L.P. (EcoR1 Qualified Fund), as of December 31, 2018, all three reporting persons hold shared voting and dispositive power over the shares of common stock. EcoR1 Qualified Fund may be deemed to beneficially own 2,008,966 shares of common stock (7.9%). EcoR1 Capital, LLC, as the general partner of EcoR1 Qualified Fund, may be deemed to beneficially own the 2,404,853 shares of common stock owned by EcoR1 Qualified Fund. Oleg Nodelman, as the control person of EcoR1 Capital, LLC may be deemed to beneficially own the 2,404,853 shares of common stock, including 2,008,966 deemed beneficially owned by EcoR1 Qualified Fund. According to the Schedule 13G/A, EcoR1 Qualified Fund is not a member of a group and expressly disclaims membership in a group. In addition, EcoR1 Qualified Fund disclaims that it is a beneficial owner of any stock covered by the Schedule 13G/A. Each filer also disclaims beneficial ownership of the stock except to the extent of that person's pecuniary interest therein.
- (3) Based on the information contained in the Schedule 13G filed with the SEC on February 12, 2019 by Wellington Management Group LLP, a holding company, Wellington Group Holdings LLP, a holding company, Wellington Investment Advisors Holdings LLP, a holding company and Wellington Management Company LLP, an investment advisor (collectively, Wellington), as of December 31, 2018, Wellington beneficially owns 2,316,457 shares of common stock (9.10%). Wellington Management Group, LLP has shared voting power over 2,063,197 shares of common stock and shared dispositive power over 2,316,457 shares of common stock. Wellington Group Holdings, LLP has shared voting power over 2,063,197 shares of common stock and has shared dispositive power over 2,316,457 shares of common stock. Wellington Investment Advisors Holdings LLP has shared voting power over 2,063,197 shares of common stock and has shared dispositive power over 2,316,457 shares of common stock. Wellington Management Company LP beneficially owns 2,101,917 and has shared voting power over 1,971,635 shares of common stock and has shared dispositive power over 2,101,917 shares of common stock.
- (4) Based on the information contained in the Schedule 13G/A filed with the SEC on February 4, 2019 by BlackRock, Inc. (Blackrock), a parent holding company or control person, as of December 31, 2018, BlackRock beneficially owns 1,909,510 shares of common stock (7.5%). BlackRock has sole voting power over 1,851,713 shares of common stock and sole dispositive power over 1,909,510 shares of

common stock. Various persons have the right to receive or the power to direct the receipt of dividends from, or the proceeds from the sale of the common stock. No one person's interest in the common stock is more than five percent of the total outstanding common shares. Subsidiaries holding shares of common stock are as follows: BlackRock Advisors, LLC, BlackRock Capital Management, Inc., BlackRock (Netherlands) B.V., BlackRock Institutional Trust Company, National Association, BlackRock Asset Management Ireland Limited, BlackRock Financial Management, Inc., BlackRock Japan Co., Ltd, BlackRock Asset Management Schweiz AG, BlackRock Investment Management, LLC, BlackRock Investment Management (UK) Limited, BlackRock Asset Management Canada Limited, BlackRock (Luxembourg) S.A., BlackRock Fund Advisors.

- (5) Includes 8,000 shares of common stock and 99,000 shares of common stock that Mr. Altig has the right to acquire from us within 60 days after the Table Date pursuant to the exercise of stock options.
- (6) Includes shares of common stock that the individual has the right to acquire from us within 60 days after the Table Date pursuant to the exercise of stock options.
- (7) Includes 319,240 shares of common stock and 99,000 shares of common stock that Dr. DiMarchi has the right to acquire from us within 60 days after the Table Date pursuant to the exercise of stock options.
- (8) Includes 19,465 shares of common stock and 84,000 shares of common stock that Mr. Ringo has the right to acquire from us within 60 days after the Table Date pursuant to the exercise of stock options.
- (9) Includes (i) 634,391 shares of common stock, (ii) 8,125 RSUs held by Mr. Small that are scheduled to vest and settle on March 29, 2019 and (iii) 523,842 shares of common stock that Mr. Small has the right to acquire from us within 60 days after the Table Date pursuant to the exercise of stock options. Excludes 24,375 RSUs held by Mr. Small that are not scheduled to vest within 60 days after the Table Date.
- (10) Consists of (i) 3,750 RSUs held by Dr. Colonna that are scheduled to vest and settle on March 29, 2019 and (ii) 188,125 shares of common stock that Dr. Colonna has the right to acquire from us within 60 days after the Table Date pursuant to the exercise of stock options. Excludes 95,000 RSUs that are vested but not scheduled to settle within 60 days after the Table and 11,250 RSUs held by Dr. Colonna that are not scheduled to vest within 60 days after the Table Date.
- (11) Consists of 85,556 shares of common stock that Mr. Cooper has the right to acquire from us within 60 days after the Table Date pursuant to the exercise of stock options. Excludes 100,000 RSUs that are not scheduled to vest within 60 days after the Table Date.
- (12) Consists of (i) 611,111 shares of common stock, of which 5,000 shares of Common Stock are owned beneficially by Dr. Lopatin's wife and 606,111 are owned by the Uri Lopatin Revocable Trust, for which Dr. Lopatin is the trustee and sole beneficiary and (ii) 1,750 RSUs held by Dr. Lopatin that are scheduled to vest and settle on March 29, 2019, and (iii) 187,500 shares of common stock that Dr. Lopatin has the right to acquire from us within 60 days after the Table Date pursuant to the exercise of stock options. Excludes 5,625 RSUs held by Dr. Lopatin that are not scheduled to vest within 60 days after the Table Date.
- (13) Consists of 28,763 shares of common stock that Dr. Papkoff has the right to acquire from us within 60 days after the Table Date pursuant to the exercise of stock options. Excludes 10,625 RSUs that are not scheduled to vest within 60 days after the Table Date.
- (14) Consists of (i) 484,998 shares of common stock, of which 84,998 are owned jointly with Mr. Barrett's spouse and 800,000 shares of common stock are held in family trusts, and (ii) 484,942 shares of common stock that Mr. Barrett has the right to acquire from us within 60 days after the Table Date pursuant to the exercise of stock options. Excludes 66,668 RSUs that are not scheduled to vest and settle within 60 days after the Table Date
- (15) Includes the shares of common stock described in footnotes (5) through (13).

**SECTION 16(A) BENEFICIAL OWNERSHIP REPORTING COMPLIANCE**

Pursuant to Section 16(a) of the Securities Exchange Act, our directors and executive officers are required to file reports with the SEC indicating their holdings of and transactions in our equity securities. To our knowledge, based solely on our review of the copies of such reports furnished to us and written representations, our officers, directors and holders of more than 10% of our common stock complied with all applicable filing requirements during the fiscal year ended December 31, 2018.

**DEADLINE FOR STOCKHOLDER PROPOSALS FOR THE 2020 ANNUAL MEETING OF STOCKHOLDERS**

Any stockholder who meets the requirements of the proxy rules under the Exchange Act may submit proposals to the Board to be included in next year's proxy statement and on our proxy card for the 2020 Annual Meeting of Stockholders. Such proposals must comply with the requirements of Rule 14a-8 under the Exchange Act. To be considered for inclusion in next year's proxy materials, any proposals must be submitted in writing by December 6, 2019, to our Corporate Secretary at 11711 N. Meridian Street, Suite 310, Carmel, Indiana 46032; provided, however, that if our 2020 Annual Meeting of Stockholders is held before April 17, 2020 or after June 16, 2020, then the deadline is a reasonable amount of time prior to the date we begin to print and send our proxy statement for the 2020 Annual Meeting of Stockholders.

Subject to compliance with applicable requirements of state law and the Exchange Act, our Amended and Restated Bylaws also provide for separate notice procedures to propose business to be considered by stockholders at a meeting, provided that such proposal would not be included in next year's proxy materials. Such proposals must comply with the requirements, including without limitation, the separate notice procedures, of our Amended and Restated Bylaws. If you wish to submit such a proposal, written notice must be received by the Corporate Secretary no later than the close of business not more than 90 days before or less than 60 days before the date of the meeting, in the case of the 2020 Annual Meeting of Stockholders or any other annual meeting, or by the tenth business day following the day on which public announcement of the date of the meeting is first made, in the case of a special meeting.

Our Amended and Restated Bylaws permit a stockholder, or a group of up to 20 eligible stockholders, that has owned at least 3% of our outstanding common stock for at least three years to nominate and include in our proxy statement candidates for the Board, subject to certain requirements. Any such nomination must be received at the address above no earlier than the close of business on November 6, 2019 and no later than the close of business on December 6, 2019; provided, however, that if our 2020 Annual Meeting of Stockholders is held before April 17, 2020 or after June 16, 2020, then the deadline is the close of business on the date that is 180 days prior to the 2020 Annual Meeting of Stockholders or the tenth day following the date that the 2020 Annual Meeting of Stockholders is first publicly disclosed. Any such notice must meet the other requirements set forth in our Amended and Restated Bylaws, which are publicly available on the SEC's website.

Our Amended and Restated Bylaws also provide for separate notice procedures to recommend a person for nomination as a director, provided that such nominee would not be included in next year's proxy materials. Such proposals must comply with the requirements, including without limitation, the separate notice procedures, of our Amended and Restated Bylaws. If you wish to nominate a director, written notice must be received by the Corporate Secretary no later than the close of business not more than 90 days before or less than 60 days before the date of the meeting, in the case of the 2020 Annual Meeting of Stockholders or any other annual meeting, or not later than the tenth business day following the day on which public announcement of the date of the meeting is first made, in the case of a special meeting or in the event that less than 70 days' notice or prior public disclosure of the date of the annual meeting is given or made to stockholders.

**DELIVERY OF DOCUMENTS TO STOCKHOLDERS SHARING AN ADDRESS**

The SEC has adopted rules that permit companies to deliver a single Proxy Availability Notice or a single copy of proxy materials to multiple stockholders sharing an address unless a company has received contrary instructions from one or more of the stockholders at that address. Upon request, we will promptly deliver a separate Proxy Availability Notice or separate copy of proxy materials to one or more stockholders at a shared address to which a single Proxy Availability Notice or a single copy of proxy materials was delivered. Stockholders may request a separate Proxy Availability Notice or separate copy of proxy materials by contacting our Corporate Secretary either by calling 1 833-509-4583 or by mailing a request to 11711 N. Meridian Street, Suite 310, Carmel, Indiana 46032. Stockholders at a shared address who receive multiple Proxy Availability Notices or multiple copies of proxy materials may request to receive a single Proxy Availability Notice or a single copy of proxy materials in the future in the same manner as described above.

**OTHER MATTERS**

The Board knows of no other business to be brought before the meeting, but intends that, as to any such other business, the shares will be voted pursuant to the proxy in accordance with the best judgment of the person or persons acting thereunder.

**Appendix A**

**Proposed Amendment No. 1 to Assembly Biosciences, Inc. 2018 Stock Incentive Plan**

**AMENDMENT NO. 1**

**TO**

**ASSEMBLY BIOSCIENCES, INC.  
2018 STOCK INCENTIVE PLAN**

Assembly Biosciences, Inc., a Delaware corporation (the “Company”) adopted the 2018 Stock Incentive Plan on May 30, 2018 (as amended from time to time, the “Plan”).

Prior to this Amendment No. 1 to the Plan, the number of shares of Common Stock, par value \$0.001 per share, reserved under the Plan was 1,900,000.

The Board of Directors of the Company (the “Board”) may, with stockholder approval, amend the Plan to increase the number of authorized shares reserved for issuance under the Plan.

The Board has determined that it is advantageous to the Company and necessary to attract and retain the best available personnel to amend the Plan to increase the number of shares reserved for issuance under the Plan.

Now, therefore, the Plan is hereby amended as follows:

1. Sections 3(a) and 3(b) of the Plan shall be amended and restated as follows:

“(a) Subject to the provisions of Sections 3(b) and 12 below, the maximum aggregate number of Shares which may be issued pursuant to all Awards (including Incentive Stock Options) is Three Million (3,000,000) Shares. The Shares granted under the Plan may be authorized, but unissued, or reacquired Common Stock.

(b) Any Shares covered by an Award (or portion of an Award) which is forfeited, canceled or expires (whether voluntarily or involuntarily) shall be deemed not to have been issued for purposes of determining the maximum aggregate number of Shares which may be issued under the Plan, except that the maximum aggregate number of Shares which may be issued pursuant to the exercise of Incentive Stock Options shall not exceed the number specified in Section 3(a). Shares that actually have been issued under the Plan pursuant to an Award shall not be returned to the Plan and shall not become available for future issuance under the Plan, except that if Options or other Awards granted under this Plan are forfeited or repurchased by the Company, such Shares shall become available for future grant under the Plan. In the event any Option or other Award granted under the Plan is exercised through the tendering of shares of Common Stock (either actually or through attestation) or withholding shares of Common Stock, or in the event tax withholding obligations are satisfied by tendering or withholding shares of Common Stock, any shares of Common Stock so tendered or withheld shall not again be available for awards under the Plan. Shares of Common Stock subject to an SAR granted pursuant to Section 6(k) of this Plan that are not issued in connection with cash or stock settlement of the exercise of the SAR shall not again be available for award under the Plan. Shares of Common Stock reacquired by the Company on the open market or otherwise using cash proceeds from the exercise of Options shall not be available for awards under the Plan.

Except as expressly set forth in this Amendment No. 1, all other terms and conditions set forth in the Plan shall remain in full force and effect. Each capitalized term used and not defined herein shall have the meaning set forth in the Plan.

Subject to approval of the stockholders, this Amendment has been adopted by the Board of Directors of the Company as of March 8, 2019.

This Amendment will be submitted to the stockholders of the Company for approval at the annual stockholders meeting to be held on May 17, 2019 and will become effective upon receipt of approval by the stockholders.

**Appendix B**

**Assembly Biosciences, Inc. 2018 Stock Incentive Plan, Incorporating Proposed Amendment**

**ASSEMBLY BIOSCIENCES, INC.**

**2018 STOCK INCENTIVE PLAN**

1. **Purposes of the Plan.** The purposes of this Plan are to attract and retain the best available personnel, to provide additional incentives to Employees, Directors and Consultants and to promote the success of the Company's business.

2. **Definitions.** The following definitions shall apply as used herein and in the individual Award Agreements except as defined otherwise in an individual Award Agreement. In the event a term is separately defined in an individual Award Agreement, such definition shall supersede the definition contained in this Section 2.

(a) "**Administrator**" means the Board or any of the Committees appointed to administer the Plan.

(b) "**Affiliate**" and "**Associate**" shall have the respective meanings ascribed to such terms in Rule 12b-2 promulgated under the Exchange Act.

(c) "**Applicable Laws**" means the legal requirements relating to the Plan and the Awards under applicable provisions of federal and state securities laws, the corporate laws of California and, to the extent other than California, the corporate law of the state of the Company's incorporation, the Code, the rules of any applicable stock exchange or national market system, and the rules of any non-U.S. jurisdiction applicable to Awards granted to residents therein.

(d) "**Assumed**" means that pursuant to a Corporate Transaction either (i) the Award is expressly affirmed by the Company or (ii) the contractual obligations represented by the Award are expressly assumed (and not simply by operation of law) by the successor entity or its Parent in connection with the Corporate Transaction with appropriate adjustments to the number and type of securities of the successor entity or its Parent subject to the Award and the exercise or purchase price thereof which at least preserves the compensation element of the Award existing at the time of the Corporate Transaction as determined in accordance with the instruments evidencing the agreement to assume the Award.

(e) "**Award**" means the grant of an Option, SAR, Dividend Equivalent Right, Restricted Stock, Restricted Stock Unit, Unrestricted Stock or other right or benefit under the Plan.

(f) "**Award Agreement**" means the written agreement evidencing the grant of an Award executed by the Company and the Grantee, including any amendments thereto.

(g) "**Board**" means the Board of Directors of the Company.

(h) "**Cause**" means, with respect to the termination by the Company or a Related Entity of the Grantee's Continuous Service, that such termination is for "Cause" as such term (or word of like import) is expressly defined in a then-effective written agreement between the Grantee and the Company or such Related Entity, or in the absence of such then-effective written agreement and definition, is based on, in the determination of the Administrator, the Grantee's: (i) performance of any act or failure to perform any act in bad faith and to the detriment of the Company or a Related Entity; (ii) dishonesty, intentional misconduct or material breach of any agreement with the Company or a Related Entity; or (iii) commission of a crime involving dishonesty, breach of trust, or physical or emotional harm to any person; provided, however, that with regard to any agreement that defines "Cause" on the occurrence of or in connection with a Corporate Transaction, such definition of "Cause" shall not apply until a Corporate Transaction actually occurs.

(i) "**Code**" means the Internal Revenue Code of 1986, as amended, or any successor statute.

(j) "**Committee**" means any committee composed of members of the Board appointed by the Board to administer the Plan.



(k) “**Common Stock**” means the Company’s Common Stock, par value \$0.001 per share.

(l) “**Company**” means Assembly Biosciences, Inc., a Delaware corporation, formerly known as Ventrus Biosciences, Inc., or any successor entity that adopts the Plan in connection with a Corporate Transaction.

(m) “**Consultant**” means any natural person (other than an Employee or a Director, solely with respect to rendering services in such person’s capacity as a Director) who provides bona fide services to the Company or any Related Entity, within the meaning of Form S-8 promulgated under the Securities Act of 1933, as amended, and provided, further, that a Consultant will include only those persons to whom the issuance of Shares may be registered under Form S-8 promulgated under the Securities Act of 1933, as amended.

(n) “**Continuous Service**” means that the provision of services to the Company or a Related Entity in any capacity of Employee, Director or Consultant is not interrupted or terminated. In jurisdictions requiring notice in advance of an effective termination as an Employee, Director or Consultant, Continuous Service shall be deemed terminated upon the actual cessation of providing services to the Company or a Related Entity notwithstanding any required notice period that must be fulfilled before a termination as an Employee, Director or Consultant can be effective under Applicable Laws. A Grantee’s Continuous Service shall be deemed to have terminated either upon an actual termination of Continuous Service or upon the entity for which the Grantee provides services ceasing to be a Related Entity. Continuous Service shall not be considered interrupted in the case of (i) any approved leave of absence, (ii) transfers among the Company, any Related Entity, or any successor in any capacity of Employee, Director or Consultant, or (iii) any change in status as long as the individual remains in the service of the Company or a Related Entity in any capacity of Employee, Director or Consultant (except as otherwise provided in the Award Agreement). An approved leave of absence shall include sick leave, military leave, or any other authorized personal leave. For purposes of each Incentive Stock Option granted under the Plan, if such leave exceeds three (3) months, and reemployment upon expiration of such leave is not guaranteed by statute or contract, then the Incentive Stock Option shall be treated as a Non-Qualified Stock Option on the day three (3) months and one (1) day following the expiration of such three (3) month period.

(o) “**Corporate Transaction**” means any of the following transactions, provided, however, that the Administrator shall determine under parts (iv) and (v) whether multiple transactions are related, and its determination shall be final, binding and conclusive:

(i) a merger or consolidation in which the Company is not the surviving entity, except for a transaction the principal purpose of which is to change the state in which the Company is incorporated;

(ii) the sale, transfer or other disposition of all or substantially all of the assets of the Company;

(iii) the complete liquidation or dissolution of the Company;

(iv) any reverse merger or series of related transactions culminating in a reverse merger (including, but not limited to, a tender offer followed by a reverse merger) in which the Company is the surviving entity but (A) the shares of Common Stock outstanding immediately prior to such merger are converted or exchanged by virtue of the merger into other property, whether in the form of securities, cash or otherwise, or (B) in which securities possessing more than fifty percent (50%) of the total combined voting power of the Company’s outstanding securities are transferred to a person or persons different from those who held such securities immediately prior to such merger or the initial transaction culminating in such merger; or

(v) acquisition in a single or series of related transactions by any person or related group of persons (other than the Company or by a Company-sponsored employee benefit plan) of beneficial ownership (within the meaning of Rule 13d-3 of the Exchange Act) of securities possessing more than fifty percent (50%) of the total combined voting power of the Company’s outstanding securities.

(q) “**Director**” means a member of the Board or the board of directors of any Related Entity.

(r) “**Disability**” shall have the meaning set forth in the long-term disability policy of the Company or the Related Entity to which the Grantee provides services regardless of whether the Grantee is covered by such policy. If the Company or the Related Entity to which the Grantee provides service does not have a long-term disability plan in place, “Disability” means that a Grantee is unable to carry out the responsibilities and functions of the position held by the Grantee by reason of any medically determinable physical or mental impairment for a period of not less than ninety (90) consecutive days. A Grantee will not be considered to have incurred a Disability unless he or she furnishes proof of such impairment sufficient to satisfy the Administrator in its discretion.

(s) “**Disqualifying Disposition**” means any disposition (including any sale) of Common Stock received upon exercise of an Incentive Stock Option before either (i) two (2) years after the date the Employee was granted the Incentive Stock Option, or (ii) one (1) year after the date the Employee acquired Common Stock by exercising the Incentive Stock Option. If the Employee has died before such stock is sold, these holding period requirements do not apply and no Disqualifying Disposition can occur thereafter.

(t) “**Dividend Equivalent Right**” means a right entitling the Grantee to compensation measured by dividends paid with respect to Common Stock.

(u) “**Employee**” means any person, including an Officer or Director, who is in the employ of the Company or any Related Entity, subject to the control and direction of the Company or any Related Entity as to both the work to be performed and the manner and method of performance. The payment of a director’s fee by the Company or a Related Entity shall not be sufficient to constitute “employment” by the Company.

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

(w) “**Fair Market Value**” means, as of any date, the value of Common Stock determined as follows.

(i) If the Common Stock is listed on one or more established stock exchanges or national market systems, including without limitation The NASDAQ Global Select Market, The NASDAQ Global Market or The NASDAQ Capital Market of The NASDAQ Stock Market LLC, its Fair Market Value shall be the closing sales price for such stock (or the closing bid, if no sales were reported) as quoted on the principal exchange or system on which the Common Stock is listed (as determined by the Administrator) on the date of determination (or, if no closing sales price or closing bid was reported on that date, as applicable, on the last trading date such closing sales price or closing bid was reported), as reported in The Wall Street Journal or such other source as the Administrator deems reliable;

(ii) If the Common Stock is regularly quoted on an automated quotation system (including the OTC Bulletin Board) or by a recognized securities dealer, its Fair Market Value shall be the closing sales price for such stock as quoted on such system or by such securities dealer on the date of determination, but if selling prices are not reported, the Fair Market Value of a share of Common Stock shall be the mean between the high bid and low asked prices for the Common Stock on the date of determination (or, if no such prices were reported on that date, on the last date such prices were reported), as reported in The Wall Street Journal or such other source as the Administrator deems reliable; or

(iii) In the absence of an established market for the Common Stock of the type described in (i) and (ii), above, the Fair Market Value thereof shall be determined by the Administrator in a manner in compliance with Section 409A of the Code, and in the case of an Incentive Stock Option, in a manner in compliance with Section 422 of the Code.

(x) “**Grantee**” means an Employee, Director or Consultant who receives an Award under the Plan.

(y) “**Incentive Stock Option**” means an Option designated and qualified as an incentive stock option within the meaning of Section 422 of the Code.

(z) “**Non-Qualified Stock Option**” means an Option that is not an Incentive Stock Option.

(aa) “**Officer**” means a person who is an officer of the Company or a Related Entity within the meaning of Section 16 of the Exchange Act and the rules and regulations promulgated thereunder.

(bb) “**Option**” means an option to purchase Shares pursuant to an Award Agreement granted under the Plan.

(cc) “**Parent**” means a “parent corporation,” whether now or hereafter existing, as defined in Section 424(e) of the Code.

(dd) “**Plan**” means this Assembly Biosciences, Inc. 2018 Stock Incentive Plan.

(ee) “**Post-Termination Exercise Period**” means the period specified in the Award Agreement of not less than thirty (30) days commencing on the date of termination (other than termination by the Company or any Related Entity for Cause) of the Grantee’s Continuous Service, or such longer period as may be applicable upon death or Disability.

(ff) “**Related Entity**” means any Parent or Subsidiary of the Company.

(gg) “**Replaced**” means that pursuant to a Corporate Transaction the Award is replaced with a comparable stock award or a cash incentive program of the Company, the successor entity (if applicable) or Parent of either of them which preserves the compensation element of such Award existing at the time of the Corporate Transaction and provides for subsequent payout in accordance with the same (or a more favorable) vesting schedule applicable to such Award. The determination of Award comparability shall be made by the Administrator and its determination shall be final, binding and conclusive.

(hh) “**Restricted Stock**” means Shares issued under the Plan to the Grantee for such consideration, if any, and subject to such restrictions on transfer, rights of first refusal, repurchase provisions, forfeiture provisions, and other terms and conditions as established by the Administrator.

(ii) “**Restricted Stock Units**” means an Award which may be earned in whole or in part upon the passage of time or the attainment of performance criteria established by the Administrator and which may be settled for cash, Shares or other securities or a combination of cash, Shares or other securities as established by the Administrator.

(jj) “**Rule 16b-3**” means Rule 16b-3 promulgated under the Exchange Act or any successor thereto.

(kk) “**SAR**” means a stock appreciation right entitling the Grantee to Shares or cash compensation, as established by the Administrator, measured by appreciation in the value of Common Stock.

(ll) “**Share**” means a share of the Common Stock.

(mm) “**Subsidiary**” means a “subsidiary corporation,” whether now or hereafter existing, as defined in Section 424(f) of the Code.

(nn) “**Unrestricted Stock**” means an award of Shares free from any risks of forfeiture.

### 3. Stock Subject to the Plan.

(a) Subject to the provisions of Sections 3(b) and 12 below, the maximum aggregate number of Shares which may be issued pursuant to all Awards (including Incentive Stock Options) is ~~One Million Nine Hundred Thousand~~ **Three Million Shares (3,000,000)** Shares. The Shares granted under the Plan may be authorized, but unissued, or reacquired Common Stock.

(b) Any Shares covered by an Award (or portion of an Award) which is forfeited, canceled or expires (whether voluntarily or involuntarily) shall be deemed not to have been issued for purposes of determining the maximum aggregate number of Shares which may be issued under the Plan, except that the maximum aggregate number of Shares which may be issued pursuant to the exercise of Incentive Stock Options shall not exceed the number specified in Section 3(a). Shares that actually have been issued under the Plan pursuant to an Award shall not be returned to the Plan and shall not

become available for future issuance under the Plan, except that if Options or other Awards granted under this Plan ~~or the Company's Amended and Restated 2014 Stock Incentive Plan (the "2014 Plan")~~ are forfeited or repurchased by the Company, such Shares shall become available for future grant under the Plan. In the event any Option or other Award granted under the Plan ~~or the 2014 Plan~~ is exercised through the tendering of shares of Common Stock (either actually or through attestation) or withholding shares of Common Stock, or in the event tax withholding obligations are satisfied by tendering or withholding shares of Common Stock, any shares of Common Stock so tendered or withheld shall not again be available for awards under the Plan. Shares of Common Stock subject to an SAR granted pursuant to Section 6(k) of this Plan ~~or the 2014 Plan~~ that are not issued in connection with cash or stock settlement of the exercise of the SAR shall not again be available for award under the Plan. Shares of Common Stock reacquired by the Company on the open market or otherwise using cash proceeds from the exercise of Options shall not be available for awards under the Plan.

(c) Notwithstanding anything to the contrary in this Plan, the value of all Awards awarded under this Plan and all other cash compensation paid by the Company to any non-employee Director in any calendar year shall not exceed \$1,000,000. For the purpose of this limitation, the value of any Award shall be its grant date fair value, as determined in accordance with ASC 718 or successor provision but excluding the impact of estimated forfeitures related to service-based vesting provisions.

#### 4. Administration of the Plan.

##### (a) Plan Administrator.

(i) Administration with Respect to Directors and Officers. With respect to grants of Awards to Directors or Employees who are also Officers or Directors of the Company, the Plan shall be administered by (A) the Board or (B) a Committee designated by the Board, which Committee shall be constituted in such a manner as to satisfy the Applicable Laws and to permit such grants and related transactions under the Plan to be exempt from Section 16(b) of the Exchange Act in accordance with Rule 16b-3. Once appointed, such Committee shall continue to serve in its designated capacity until otherwise directed by the Board.

(ii) Administration With Respect to Consultants and Other Employees. With respect to grants of Awards to Employees or Consultants who are neither Directors nor Officers of the Company, the Plan shall be administered by (A) the Board or (B) a Committee designated by the Board, which Committee shall be constituted in such a manner as to satisfy the Applicable Laws. Once appointed, such Committee shall continue to serve in its designated capacity until otherwise directed by the Board.

(b) Multiple Administrative Bodies. The Plan may be administered by different bodies with respect to Directors, Officers, Consultants, and Employees who are neither Directors nor Officers.

(c) Powers of the Administrator. Subject to Applicable Laws and the provisions of the Plan (including any other powers given to the Administrator hereunder), and except as otherwise provided by the Board, the Administrator shall have the authority, in its discretion:

(i) to select the Employees, Directors and Consultants to whom Awards may be granted from time to time hereunder;

(ii) to determine whether and to what extent Awards are granted hereunder;

(iii) to determine the number of Shares or the amount of other consideration to be covered by each Award granted hereunder;

(iv) to approve forms of Award Agreements for use under the Plan;

(v) to determine the type, terms and conditions of any Award granted hereunder;

(vi) to establish additional terms, conditions, rules or procedures to accommodate the rules or laws of applicable non-U.S. jurisdictions and to afford Grantees favorable treatment under such rules or laws; provided, however, that no Award shall be granted under any such additional terms, conditions, rules or procedures with terms or conditions which are inconsistent with the provisions of the Plan;

(vii) to amend the terms of any outstanding Award granted under the Plan, provided that any amendment that would adversely affect the Grantee's rights under an outstanding Award shall not be made without the Grantee's written consent; provided, however, that an amendment or modification that may cause an Incentive Stock Option to become a Non-Qualified Stock Option shall not be treated as adversely affecting the rights of the Grantee;

(viii) to construe and interpret the terms of the Plan and Awards, including without limitation, any notice of award or Award Agreement, granted pursuant to the Plan;

(ix) to institute an option exchange program; and

(x) to take such other action, not inconsistent with the terms of the Plan, as the Administrator deems appropriate.

The express grant in the Plan of any specific power to the Administrator shall not be construed as limiting any power or authority of the Administrator; provided that the Administrator may not exercise any right or power reserved to the Board. Any decision made, or action taken, by the Administrator or in connection with the administration of this Plan shall be final, conclusive and binding on all persons having an interest in the Plan.

(d) Indemnification. In addition to such other rights of indemnification as they may have as members of the Board or as Officers or Employees of the Company or a Related Entity, members of the Board and any Officers or Employees of the Company or a Related Entity to whom authority to act for the Board, the Administrator or the Company is delegated shall be defended and indemnified by the Company to the extent permitted by law on an after-tax basis against all reasonable expenses, including attorneys' fees, actually and necessarily incurred in connection with the defense of any claim, investigation, action, suit or proceeding, or in connection with any appeal therein, to which they or any of them may be a party by reason of any action taken or failure to act under or in connection with the Plan, or any Award granted hereunder, and against all amounts paid by them in settlement thereof (provided such settlement is approved by the Company) or paid by them in satisfaction of a judgment in any such claim, investigation, action, suit or proceeding, except in relation to matters as to which it shall be adjudged in such claim, investigation, action, suit or proceeding that such person is liable for gross negligence, bad faith or intentional misconduct; provided, however, that within thirty (30) days after the institution of such claim, investigation, action, suit or proceeding, such person shall offer to the Company, in writing, the opportunity at the Company's expense to defend the same.

5. Eligibility. Awards other than Incentive Stock Options may be granted to Employees, Directors and Consultants of the Company and any Related Entity. Incentive Stock Options may be granted only to Employees of the Company or a Parent or a Subsidiary of the Company. An Employee, Director or Consultant who has been granted an Award may, if otherwise eligible, be granted additional Awards. Awards may be granted to such Employees, Directors or Consultants who are residing in non-U.S. jurisdictions as the Administrator may determine from time to time.

#### 6. Terms and Conditions of Awards.

(a) Types of Awards. The Administrator is authorized under the Plan to award any type of arrangement to an Employee, Director or Consultant that is not inconsistent with the provisions of the Plan and that by its terms involves or might involve the issuance of (i) Shares, (ii) cash or (iii) an Option, an SAR, or similar right with a fixed or variable price related to the Fair Market Value of the Shares and with an exercise or conversion privilege related to the passage of time, the occurrence of one or more events, or the satisfaction of performance criteria or other conditions. Such awards include, without limitation, Options, SARs, sales or bonuses of Restricted Stock, Restricted Stock Units, Unrestricted Stock or Dividend Equivalent Rights, and an Award may consist of one (1) such security or benefit, or two (2) or more of them in any combination or alternative. Unrestricted Stock may be granted in respect of past services or other valid consideration, or in lieu of cash compensation due to the grantee.

(b) Designation of Award. Each Award shall be designated in the Award Agreement. In the case of an Option, the Option shall be designated as either an Incentive Stock Option or a Non-Qualified Stock Option. However, notwithstanding such designation, an Option will qualify as an Incentive Stock Option under the Code only to the extent the \$100,000 dollar limitation of Section 422(d) of the Code is not exceeded. The \$100,000 limitation of Section 422(d) of the Code is calculated based on the aggregate Fair Market Value of the Shares subject to Options designated as Incentive Stock Options which become exercisable for the first time by a Grantee during any calendar year (under all plans of the Company or any Parent or Subsidiary of the Company). For purposes of this calculation, Incentive Stock Options shall be taken into account in the order in which they were granted, and the Fair Market Value of the Shares shall be determined as of the grant date of the relevant Option.

(c) Conditions of Award. Subject to the terms of the Plan, the Administrator shall determine the provisions, terms, and conditions of each Award including, but not limited to, the Award vesting schedule, repurchase provisions, rights of first refusal, forfeiture provisions, form of payment (cash, Shares, or other consideration) upon settlement of the Award, payment contingencies, and satisfaction of any performance criteria. The performance criteria established by the Administrator may be based on any one of, or combination of, increase in share price, earnings per share, total stockholder return, return on equity, return on assets, return on investment, net operating income, cash flow, revenue, economic value added, initiation or completion of clinical trials, results of clinical trials, regulatory approval, regulatory submissions, drug development or commercialization milestones, collaboration milestones or strategic partnerships. Partial achievement of the specified criteria may result in a payment or vesting corresponding to the degree of achievement as specified in the Award Agreement.

(d) Acquisitions and Other Transactions. The Administrator may issue Awards under the Plan in settlement, assumption or substitution for, outstanding awards or obligations to grant future awards in connection with the Company or a Related Entity acquiring another entity, an interest in another entity or an additional interest in a Related Entity whether by merger, stock purchase, asset purchase or other form of transaction.

(e) Deferral of Award Payment. The Administrator may establish one or more programs under the Plan to permit selected Grantees the opportunity to elect to defer receipt of consideration upon exercise of an Award, satisfaction of performance criteria, or other event that absent the election would entitle the Grantee to payment or receipt of Shares or other consideration under an Award. The Administrator may establish the election procedures, the timing of such elections, the mechanisms for payments of, and accrual of interest or other earnings, if any, on amounts, Shares or other consideration so deferred, and such other terms, conditions, rules and procedures that the Administrator deems advisable for the administration of any such deferral program.

(f) Separate Programs. The Administrator may establish one or more separate programs under the Plan for the purpose of issuing particular forms of Awards to one or more classes of Grantees on such terms and conditions as determined by the Administrator from time to time.

(g) Early Exercise. The Award Agreement may, but need not, include a provision whereby the Grantee may elect at any time while an Employee, Director or Consultant to exercise any part or all of the Award prior to full vesting of the Award. Any unvested Shares received pursuant to such exercise may be subject to a repurchase right in favor of the Company or a Related Entity or to any other restriction the Administrator determines to be appropriate.

(h) Term of Option or SAR. The term of each Option or SAR shall be the term stated in the Award Agreement, provided, however, that the term shall be no more than ten (10) years from the date of grant thereof. However, in the case of an Incentive Stock Option granted to a Grantee who, at the time the Option is granted, owns stock representing more than ten percent (10%) of the voting power of all classes of stock of the Company or any Parent or Subsidiary of the Company, the term of the Incentive Stock Option shall be five (5) years from the date of grant thereof or such shorter term as may be provided in the Award Agreement.

(i) Transferability of Awards. Unless the Administrator provides otherwise, in its sole discretion, no Award may be sold, pledged, assigned, hypothecated, transferred, or disposed of in any manner other than by will or by the laws of descent or distribution and may be exercised, during the lifetime of

the Grantee, only by the Grantee. Notwithstanding the foregoing, the Grantee may designate one or more beneficiaries of the Grantee's Award in the event of the Grantee's death on a beneficiary designation form provided by the Administrator.

(j) Time of Granting Awards. The date of grant of an Award shall for all purposes be the date on which the Administrator makes the determination to grant such Award, or such other later date as is determined by the Administrator.

(k) Stock Appreciation Rights. An SAR may be granted (i) with respect to any Option granted under this Plan, either concurrently with the grant of such Option or at such later time as determined by the Administrator (as to all or any portion of the shares of Common Stock subject to the Option), or (ii) alone, without reference to any related Option. Each SAR granted by the Administrator under this Plan shall be subject to the following terms and conditions. Each SAR granted to any participant shall relate to such number of shares of Common Stock as shall be determined by the Administrator, subject to adjustment as provided in Section 12. In the case of an SAR granted with respect to an Option, the number of shares of Common Stock to which the SAR pertains shall be reduced in the same proportion that the holder of the Option exercises the related Option. The exercise price of an SAR will be determined by the Administrator, in its discretion, at the date of grant but may not be less than one hundred percent (100%) of the Fair Market Value of the shares of Common Stock subject thereto on the date of grant. Subject to the right of the Administrator to deliver cash in lieu of shares of Common Stock (which, as it pertains to Officers and Directors of the Company, shall comply with all requirements of the Exchange Act), the number of shares of Common Stock which shall be issuable upon the exercise of an SAR shall be determined by dividing:

(i) the number of shares of Common Stock as to which the SAR is exercised multiplied by the amount of the appreciation in such shares (for this purpose, the "appreciation" shall be the amount by which the Fair Market Value of the shares of Common Stock subject to the SAR on the exercise date exceeds (1) in the case of an SAR related to an Option, the exercise price of the shares of Common Stock under the Option or (2) in the case of an SAR granted alone, without reference to a related Option, an amount which shall be determined by the Administrator at the time of grant, subject to adjustment under Section 12); by

(ii) the Fair Market Value of a share of Common Stock on the exercise date.

In lieu of issuing shares of Common Stock upon the exercise of an SAR, the Administrator may elect to pay the holder of the SAR cash equal to the Fair Market Value on the exercise date of any or all of the shares which would otherwise be issuable. No fractional shares of Common Stock shall be issued upon the exercise of an SAR; instead, the holder of the SAR shall be entitled to receive a cash adjustment equal to the same fraction of the Fair Market Value of a share of Common Stock on the exercise date or to purchase the portion necessary to make a whole share at its Fair Market Value on the date of exercise. The exercise of an SAR related to an Option shall be permitted only to the extent that the Option is exercisable under Section 10 on the date of surrender. Any Incentive Stock Option surrendered pursuant to the provisions of this Section 6(k) shall be deemed to have been converted into a Non-Qualified Stock Option immediately prior to such surrender.

(l) Compliance with Section 409A of the Code. Notwithstanding anything to the contrary set forth herein, any Award that is not exempt from the requirements of Section 409A of the Code shall contain such provisions so that such Award will comply with the requirements of Section 409A of the Code. Such restrictions, if any, shall be determined by the Administrator and contained in the Award Agreement evidencing such Award.

(m) Minimum Vesting. Awards granted to Employees under the Plan that are subject to time vesting shall not vest or become exercisable until at least one year after the date of grant, except in the case of death, Disability, retirement, separation of service or a Corporate Transaction. Awards granted to Directors under the Plan that are subject to time vesting shall not vest or become exercisable until at least the earlier of (i) one year after the date of grant or (ii) the next annual meeting of stockholders, except in the case of death, Disability or a Corporate Transaction.

7. Award Exercise or Purchase Price, Consideration and Taxes.

(a) Exercise or Purchase Price. The exercise or purchase price, if any, for an Award shall be as follows.

(i) In the case of an Incentive Stock Option:

(1) granted to an Employee who, at the time of the grant of such Incentive Stock Option owns stock representing more than ten percent (10%) of the voting power of all classes of stock of the Company or any Parent or Subsidiary of the Company, the per Share exercise price shall be not less than one hundred ten percent (110%) of the Fair Market Value per Share on the date of grant; or

(2) granted to any Employee other than an Employee described in the preceding paragraph, the per Share exercise price shall be not less than one hundred percent (100%) of the Fair Market Value per Share on the date of grant.

(ii) In the case of a Non-Qualified Stock Option, the per Share exercise price shall be not less than one-hundred percent (100%) of the Fair Market Value per Share on the date of grant.

(iii) In the case of other Awards, such price as is determined by the Administrator.

(iv) Notwithstanding the foregoing provisions of this Section 7(a), in the case of an Award issued pursuant to Section 6(d), above, the exercise or purchase price for the Award shall be determined in accordance with the provisions of the relevant instrument evidencing the agreement to issue such Award.

(b) Consideration. Subject to Applicable Laws, the consideration to be paid for the Shares to be issued upon exercise or purchase of an Option or upon the issuance of another Award, including the method of payment, shall be determined by the Administrator. In addition to any other types of consideration the Administrator may determine, the Administrator is authorized to accept as consideration for Shares issued under the Plan the following:

(i) cash;

(ii) check;

(iii) delivery of Grantee's promissory note with such recourse, interest, security, and redemption provisions as the Administrator determines as appropriate (but only to the extent that the acceptance or terms of the promissory note would not violate an Applicable Law); provided, however, that interest shall compound at least annually and shall be charged at the minimum rate of interest necessary to avoid (i) the imputation of interest income to the Company and compensation income to the Grantee under any applicable provisions of the Code, and (B) the classification of the Award as a liability for financial accounting purposes;

(iv) surrender of Shares or delivery of a properly executed form of attestation of ownership of Shares as the Administrator may require which have a Fair Market Value on the date of surrender or attestation equal to the aggregate exercise price of the Shares as to which said Award shall be exercised;

(v) payment through a broker-dealer sale and remittance procedure pursuant to which the Grantee (A) shall provide written instructions to a Company designated brokerage firm to effect the immediate sale of some or all of the purchased Shares and remit to the Company sufficient funds to cover the aggregate exercise price payable for the purchased Shares and (B) shall provide written directives to the Company to deliver the certificates (or other evidence satisfactory to the Company to the extent that the Shares are uncertificated) for the purchased Shares directly to such brokerage firm in order to complete the sale transaction;



(vi) with respect to Non-Qualified Options, payment through a “net exercise” such that, without the payment of any funds, the Grantee may exercise the Option and receive the net number of Shares equal to (i) the number of Shares as to which the Option is being exercised, multiplied by (ii) a fraction, the numerator of which is the Fair Market Value per Share (on such date as is determined by the Administrator) less the Exercise Price per Share, and the denominator of which is such Fair Market Value per Share; or

(vii) past or future services actually or to be rendered to the Company or a Related Entity; or

(viii) any combination of the foregoing methods of payment.

The Administrator may at any time or from time to time, by adoption of or by amendment to the standard forms of Award Agreement described in Section 4(c)(iv), or by other means, grant Awards which do not permit all of the foregoing forms of consideration to be used in payment for the Shares or which otherwise restrict one or more forms of consideration.

8. Notice to Company of Disqualifying Disposition. Each Employee who receives an Incentive Stock Option must agree to notify the Company in writing immediately after the Employee makes a Disqualifying Disposition of any Common Stock acquired pursuant to the exercise of an Incentive Stock Option.

9. Withholding of Additional Income Taxes.

(a) Upon the exercise of a Non-Qualified Stock Option or SAR, the grant of any other Award for less than the Fair Market Value of the Common Stock, the grant of Unrestricted Stock or the vesting of restricted Common Stock acquired on the exercise of an Award hereunder, the Company, in accordance with Section 3402(a) of the Code and any applicable state statute or regulation, may require the Grantee to pay to the Company additional withholding taxes in respect of the amount that is considered compensation includable in such person’s gross income. With respect to (i) the exercise of an Option, (ii) the grant of Unrestricted Stock, (iii) the grant of any other Award for less than its Fair Market Value, (iv) the vesting of restricted Common Stock acquired by exercising an Award, or (v) the exercise of an SAR, the Committee in its discretion may condition such event on the payment by the Grantee of any such additional withholding taxes.

(b) At the sole and absolute discretion of the Administrator, the holder of Awards may pay all or any part of the total estimated federal and state income tax liability arising out of the exercise or receipt of such Awards or the vesting of restricted Common Stock acquired on the exercise of an Award hereunder (each of the foregoing, a “**Tax Event**”) by tendering already-owned shares of Common Stock or by directing the Company to withhold shares of Common Stock otherwise to be transferred to the Grantee as a result of the exercise or receipt thereof in an amount equal to the estimated federal and state income tax liability arising out of such event, provided that no more Shares may be withheld than are necessary to satisfy the Grantee’s withholding obligation with respect to the exercise of Awards; provided, however, that the amount withheld does not exceed the maximum statutory tax rate or such lesser amount as is necessary to avoid liability accounting treatment for Awards granted under the Plan. In such event, the Grantee must, however, notify the Administrator of his or her desire to pay all or any part of the total estimated federal and state income tax liability arising out of a Tax Event by tendering already-owned shares of Common Stock or having shares of Common Stock withheld prior to the date that the amount of federal or state income tax to be withheld is to be determined. For purposes of this Section 9, shares of Common Stock shall be valued at their Fair Market Value on the date that the amount of the tax withholdings is to be determined.

10. Exercise of Award.

(a) Procedure for Exercise; Rights as a Stockholder.

(i) Any Award granted hereunder shall be exercisable at such times and under such conditions as determined by the Administrator under the terms of the Plan and specified in the Award Agreement.

(ii) An Award shall be deemed to be exercised when written notice of such exercise has been given to the Company in accordance with the terms of the Award by the person entitled to exercise the Award and full payment for the Shares with respect to which the Award is exercised has been made, including, to the extent selected, use of the broker-dealer sale and remittance procedure to pay the purchase price as provided in Section 7(b)(v).

(b) Exercise of Award Following Termination of Continuous Service. In the event of termination of a Grantee's Continuous Service for any reason other than Disability or death (but not in the event of a Grantee's change of status from Employee to Consultant or from Consultant to Employee), such Grantee may, but only during the Post-Termination Exercise Period (but in no event later than the expiration date of the term of such Award as set forth in the Award Agreement), exercise the portion of the Grantee's Award that was vested at the date of such termination or such other portion of the Grantee's Award as may be determined by the Administrator. The Grantee's Award Agreement may provide that upon the termination of the Grantee's Continuous Service for Cause, the Grantee's right to exercise the Award shall terminate concurrently with the termination of Grantee's Continuous Service. In the event of a Grantee's change of status from Employee to Consultant, an Employee's Incentive Stock Option shall convert automatically to a Non-Qualified Stock Option on the day three (3) months and one (1) day following such change of status. To the extent that the Grantee's Award was unvested at the date of termination, or if the Grantee does not exercise the vested portion of the Grantee's Award within the Post-Termination Exercise Period, the Award shall terminate.

(c) Disability of Grantee. In the event of termination of a Grantee's Continuous Service as a result of his or her Disability, such Grantee may, but only within twelve (12) months from the date of such termination (or such longer period as specified in the Award Agreement but in no event later than the expiration date of the term of such Award as set forth in the Award Agreement), exercise the portion of the Grantee's Award that was vested at the date of such termination; provided, however, that if such Disability is not a "disability" as such term is defined in Section 22(e)(3) of the Code, in the case of an Incentive Stock Option such Incentive Stock Option shall automatically convert to a Non-Qualified Stock Option on the day three (3) months and one (1) day following such termination. To the extent that the Grantee's Award was unvested at the date of termination, or if Grantee does not exercise the vested portion of the Grantee's Award within the time specified herein, the Award shall terminate.

(d) Death of Grantee. In the event of a termination of the Grantee's Continuous Service as a result of his or her death, or in the event of the death of the Grantee during the Post-Termination Exercise Period or during the twelve (12) month period following the Grantee's termination of Continuous Service as a result of his or her Disability, the Grantee's estate or a person who acquired the right to exercise the Award by bequest or inheritance may exercise the portion of the Grantee's Award that was vested as of the date of termination, within twelve (12) months from the date of death (or such longer period as specified in the Award Agreement but in no event later than the expiration of the term of such Award as set forth in the Award Agreement). To the extent that, at the time of death, the Grantee's Award was unvested, or if the Grantee's estate or a person who acquired the right to exercise the Award by bequest or inheritance does not exercise the vested portion of the Grantee's Award within the time specified herein, the Award shall terminate.

(e) Extension if Exercise Prevented by Law. Notwithstanding the foregoing, if the exercise of an Award within the applicable time periods set forth in this Section 10 is prevented by the provisions of Section 11 below, the Award shall remain exercisable until one (1) month after the date the Grantee is notified by the Company that the Award is exercisable, but in any event no later than the expiration of the term of such Award as set forth in the Award Agreement.

#### 11. Conditions Upon Issuance of Shares.

(a) If at any time the Administrator determines that the delivery of Shares pursuant to the exercise, vesting or any other provision of an Award is or may be unlawful under Applicable Laws, the vesting or right to exercise an Award or to otherwise receive Shares pursuant to the terms of an Award

shall be suspended until the Administrator determines that such delivery is lawful and shall be further subject to the approval of counsel for the Company with respect to such compliance. The Company shall have no obligation to effect any registration or qualification of the Shares under federal or state laws.

(b) As a condition to the exercise of an Award, the Company may require the person exercising such Award to represent and warrant at the time of any such exercise that the Shares are being purchased only for investment and without any present intention to sell or distribute such Shares if, in the opinion of counsel for the Company, such a representation is required by any Applicable Laws.

12. Adjustments. Subject to any required action by the stockholders of the Company, the number of Shares covered by each outstanding Award, and the number of Shares which have been authorized for issuance under the Plan but as to which no Awards have yet been granted or which have been returned to the Plan, the exercise or purchase price of each such outstanding Award, as well as any other terms that the Administrator determines require adjustment shall be proportionately adjusted for (i) any increase or decrease in the number of issued Shares resulting from a stock split, reverse stock split, stock dividend, combination or reclassification of the Shares, or similar transaction affecting the Shares, (ii) any other increase or decrease in the number of issued Shares effected without receipt of consideration by the Company, or (iii) any other transaction with respect to the Company's Common Stock including a corporate merger, consolidation, acquisition of property or stock, separation (including a spin-off or other distribution of stock or property), reorganization, liquidation (whether partial or complete) or any similar transaction; provided, however that conversion of any convertible securities of the Company shall not be deemed to have been "effected without receipt of consideration." Such adjustment shall be made by the Administrator and its determination shall be final, binding and conclusive. Except as the Administrator determines, no issuance by the Company of shares of stock of any class, or securities convertible into shares of stock of any class, shall affect, and no adjustment by reason hereof shall be made with respect to, the number or price of Shares subject to an Award. No adjustments shall be made for dividends paid in cash or in property other than Common Stock of the Company, nor shall cash dividends or dividend equivalents accrue or be paid in respect of unexercised Options or unvested Awards hereunder.

13. Corporate Transactions.

(a) Termination of Award to Extent Not Assumed in Corporate Transaction. Effective upon the consummation of a Corporate Transaction, all outstanding Awards under the Plan shall terminate. However, all such Awards shall not terminate to the extent they are Assumed in connection with the Corporate Transaction.

(b) Acceleration of Award Upon Corporate Transaction. The Administrator shall have the authority, exercisable either in advance of any actual or anticipated Corporate Transaction or at the time of an actual Corporate Transaction and exercisable at the time of the grant of an Award under the Plan or any time while an Award remains outstanding, to provide for the full or partial automatic vesting and exercisability of one or more outstanding unvested Awards under the Plan and the release from restrictions on transfer and repurchase or forfeiture rights of such Awards in connection with a Corporate Transaction on such terms and conditions as the Administrator may specify. The Administrator also shall have the authority to condition any such Award vesting and exercisability or release from such limitations upon the subsequent termination of the Continuous Service of the Grantee within a specified period following the effective date of the Corporate Transaction. The Administrator may provide that any Awards so vested or released from such limitations in connection with a Corporate Transaction shall remain fully exercisable until the expiration or sooner termination of the Award.

(c) Effect of Acceleration on Incentive Stock Options. Any Incentive Stock Option accelerated under this Section 13 in connection with a Corporate Transaction shall remain exercisable as an Incentive Stock Option under the Code only to the extent the \$100,000 dollar limitation of Section 422(d) of the Code is not exceeded.

14. Effective Date and Term of Plan. The Plan shall become effective upon the earlier to occur of its adoption by the Board or its approval by the stockholders of the Company. It shall continue in effect for a term of ten (10) years from the date of stockholder approval unless sooner terminated, provided that no incentive stock options may be granted under the Plan after April 5, 2028. Subject to Applicable Laws, Awards may be granted under the Plan upon Board approval, contingent on stockholder approval.

15. Amendment, Suspension or Termination of the Plan.

(a) The Board may at any time amend, suspend or terminate the Plan in any respect, except that it may not, without the approval of the stockholders obtained within twelve (12) months before or after the Board adopts a resolution authorizing any of the following actions, do any of the following:

(i) increase the total number of shares that may be issued under the Plan (except by adjustment pursuant to Section 12);

(ii) modify the provisions of Section 6 regarding eligibility for grants of ISOs may not be modified;

(iii) the provisions of Section 7(a) regarding the exercise price at which shares may be offered pursuant to Options may not be modified (except by adjustment pursuant to Section 12);

(iv) extend the expiration date of the Plan; and

(v) except as provided in Section 12 (including, without limitation, any stock dividend, stock split, extraordinary cash dividend, recapitalization, reorganization, merger, consolidation, split-up, spin-off, combination, or exchange of shares), the Company may not amend an Award granted under the Plan to reduce its exercise price per share, cancel and regrant new Awards with lower prices per share than the original prices per share of the cancelled Awards, or cancel any Awards in exchange for cash or the grant of replacement Awards with an exercise price that is less than the exercise price of the original Awards, essentially having the effect of a repricing, without approval by the Company's stockholders.

(b) No Award may be granted during any suspension of the Plan or after termination of the Plan.

(c) No suspension or termination of the Plan (including termination of the Plan under Section 15, above) shall adversely affect any rights under Awards already granted to a Grantee without his or her consent.

16. Reservation of Shares.

(a) The Company, during the term of the Plan, will at all times reserve and keep available such number of Shares as shall be sufficient to satisfy the requirements of the Plan.

(b) The inability of the Company to obtain authority from any regulatory body having jurisdiction, which authority is deemed by the Company's counsel to be necessary to the lawful issuance and sale of any Shares hereunder, shall relieve the Company of any liability in respect of the failure to issue or sell such Shares as to which such requisite authority shall not have been obtained.

17. No Effect on Terms of Employment/Consulting Relationship. The Plan shall not confer upon any Grantee any right with respect to the Grantee's Continuous Service, nor shall it interfere in any way with his or her right or the right of the Company or a Related Entity to terminate the Grantee's Continuous Service at any time, with or without Cause, and with or without notice. The ability of the Company or any Related Entity to terminate the employment of a Grantee who is employed at will is in no way affected by its determination that the Grantee's Continuous Service has been terminated for Cause for the purposes of this Plan.

18. No Effect on Retirement and Other Benefit Plans. Except as specifically provided in a retirement or other benefit plan of the Company or a Related Entity, Awards shall not be deemed compensation for purposes of computing benefits or contributions under any retirement plan of the Company or a Related

Entity, and shall not affect any benefits under any other benefit plan of any kind or any benefit plan subsequently instituted under which the availability or amount of benefits is related to level of compensation. The Plan is not a "Retirement Plan" or "Welfare Plan" under the Employee Retirement Income Security Act of 1974, as amended.

19. Stockholder Approval. Continuance of the Plan shall be subject to approval by the stockholders of the Company within twelve (12) months before or after the date the Plan is adopted by the Board. Such stockholder approval shall be obtained in the degree and manner required under Applicable Laws. Any Award exercised before stockholder approval is obtained shall be rescinded if stockholder approval is not obtained within the time prescribed, and Shares issued on the exercise of any such Award shall not be counted in determining whether stockholder approval is obtained.

20. Electronic Delivery. The Administrator may, in its sole discretion, decide to deliver any documents related to any Award granted under the Plan through an online or electronic system established and maintained by the Company or another third party designated by the Company or to request a Grantee's consent to participate in the Plan by electronic means. Each Grantee hereunder consents to receive such documents by electronic delivery and agrees to participate in the Plan through an online or electronic system established and maintained by the Company or another third party designated by the Company, and such consent shall remain in effect throughout Grantee's term of employment or service with the Company and any Related Entity and thereafter until withdrawn in writing by Grantee.

21. Data Privacy. The Administrator may, in its sole discretion, decide to collect, use and transfer, in electronic or other form, personal data as described in this Plan or any Award for the exclusive purpose of implementing, administering and managing participation in the Plan. Each Grantee hereunder acknowledges that the Company holds certain personal information about Grantee, including, but not limited to, name, home address and telephone number, date of birth, social security number or other identification number, salary, nationality, job title, details of all Awards awarded, cancelled, exercised, vested or unvested, for the purpose of implementing, administering and managing the Plan (the "**Data**"). Each Grantee hereunder further acknowledges that Data may be transferred to any third parties assisting in the implementation, administration and management of the Plan and that these third parties may be located in jurisdictions that may have different data privacy laws and protections, and Grantee authorizes such third parties to receive, possess, use, retain and transfer the Data, in electronic or other form, for the purposes of implementing, administering and managing the Plan, including any requisite transfer of such Data as may be required to a broker or other third party with whom the recipient or the Company may elect to deposit any shares of Common Stock acquired upon any Award.

22. Compliance with Section 409A. To the extent that the Administrator determines that any Award granted hereunder is subject to Section 409A of the Code, the Award Agreement evidencing such Award shall incorporate the terms and conditions necessary to avoid the consequences specified in Section 409A(a)(1) of the Code. To the extent applicable, the Plan and Award Agreements shall be interpreted in accordance with Section 409A of the Code and Department of Treasury regulations and other interpretive guidance issued thereunder, including without limitation any such regulations or other guidance that may be issued or amended after the effective date of the Plan. Notwithstanding any provision of the Plan to the contrary, in the event that following the effective date of the Plan the Administrator determines that any Award may be subject to Section 409A of the Code and related Department of Treasury guidance (including such Department of Treasury guidance as may be issued after the effective date of the Plan), the Administrator may adopt such amendments to the Plan and the applicable Award Agreement or adopt other policies and procedures (including amendments, policies and procedures with retroactive effect), or take any other actions, that the Administrator determines are necessary or appropriate to (1) exempt the Award from Section 409A of the Code and/or preserve the intended tax treatment of the benefits provided with respect to the Award, or (2) comply with the requirements of Section 409A of the Code and related Department of Treasury guidance.

23. Unfunded Obligation. Grantees shall have the status of general unsecured creditors of the Company. Any amounts payable to Grantees pursuant to the Plan shall be unfunded and unsecured obligations for all purposes, including, without limitation, Title I of the Employee Retirement Income Security Act of 1974, as amended. Neither the Company nor any Related Entity shall be required to

segregate any monies from its general funds, or to create any trusts, or establish any special accounts with respect to such obligations. The Company shall retain at all times beneficial ownership of any investments, including trust investments, which the Company may make to fulfill its payment obligations hereunder. Any investments or the creation or maintenance of any trust or any Grantee account shall not create or constitute a trust or fiduciary relationship between the Administrator, the Company or any Related Entity and a Grantee, or otherwise create any vested or beneficial interest in any Grantee or the Grantee's creditors in any assets of the Company or a Related Entity. The Grantees shall have no claim against the Company or any Related Entity for any changes in the value of any assets that may be invested or reinvested by the Company with respect to the Plan.

24. **Construction.** Captions and titles contained herein are for convenience only and shall not affect the meaning or interpretation of any provision of the Plan. Except when otherwise indicated by the context, the singular shall include the plural and the plural shall include the singular. Use of the term "or" is not intended to be exclusive, unless the context clearly requires otherwise.

As approved by the Board of Directors on April 5, 2018

And the stockholders on May 30, 2018

**Amendment No. 1 approved by the Board of Directors on March 8, 2019**

**And the stockholders on [ \_\_\_\_\_ ], 2019**



[www.assemblybio.com](http://www.assemblybio.com)

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**ASSEMBLY BIOSCIENCES, INC.  
11711 N. MERIDIAN ST, SUITE 310  
CARMEL, IN 46032**

**VOTE BY INTERNET - [www.proxyvote.com](http://www.proxyvote.com)**

Use the Internet to transmit your voting instructions and for electronic delivery of information. Vote by 11:59 P.M. EDT on May 16, 2019 for common stock held directly and by 11:59 P.M. EDT on May 14, 2019 for common stock held in a Plan. Have your proxy card in hand when you access the website and follow the instructions to obtain your records and to create an electronic voting instruction form.

**ELECTRONIC DELIVERY OF FUTURE PROXY MATERIALS**

If you would like to reduce the costs incurred by our company in mailing proxy materials, you can consent to receiving all future proxy statements, proxy cards and annual reports electronically via e-mail or the Internet. To sign up for electronic delivery, please follow the instructions above to vote using the Internet and, when prompted, indicate that you agree to receive or access proxy materials electronically in future years.

**VOTE BY PHONE - 1-800-690-6903**

Use any touch-tone telephone to transmit your voting instructions. Vote by 11:59 P.M. EDT on May 16, 2019 for common stock held directly and by 11:59 P.M. EDT on May 14, 2019 for common stock held in a Plan. Have your proxy card in hand when you call and then follow the instructions.

**VOTE BY MAIL**

Mark, sign and date your proxy card and return it in the postage-paid envelope we have provided or return it to Vote Processing, c/o Broadridge, 51 Mercedes Way, Edgewood, NY 11717.

TO VOTE, MARK BLOCKS BELOW IN BLUE OR BLACK INK AS FOLLOWS:

E69868-P18186

KEEP THIS PORTION FOR YOUR RECORDS  
DETACH AND RETURN THIS PORTION ONLY

THIS PROXY CARD IS VALID ONLY WHEN SIGNED AND DATED.

**ASSEMBLY BIOSCIENCES, INC.**

1. Election of Directors

**For All** **Withhold All** **For All Except**

To withhold authority to vote for any individual nominee(s), mark "For All Except" and write the number(s) of the nominee(s) on the line below.

**The Board of Directors recommends you vote FOR all nominees.**

**Nominees:**

01 Anthony E. Altig	04 Myron Z. Holubiak	07 Susan Mahony, Ph.D.
02 Mark Auerbach	05 Helen S. Kim	08 William R. Ringo, Jr.
03 Richard D. DiMarchi, Ph.D.	06 Alan J. Lewis, Ph.D.	09 Derek A. Small

**The Board of Directors recommends you vote FOR proposals 2, 3 and 4.**

**For Against Abstain**

2. Approval, on a non-binding advisory basis, of our named executive officers' compensation.

3. Ratification of the selection of Ernst & Young LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2019.

4. Approval of an amendment to our 2018 Stock Incentive Plan to, among other things, increase the number of shares reserved for issuance thereunder by 1,100,000 shares.

**NOTE:** Your proxy holder will also vote in their discretion upon such other matters that may properly come before the meeting and any adjournment or postponement thereof.

Please sign exactly as your name(s) appear(s) hereon. When signing as attorney, executor, administrator, or other fiduciary, please give full title as such. Joint owners should each sign personally. All holders must sign. If a corporation or partnership, please sign in full corporate or partnership name by authorized officer.

Signature [PLEASE SIGN WITHIN BOX] Date

Signature (Joint Owners) Date



**Important Notice Regarding the Availability of Proxy Materials for the Stockholder Meeting:**

The Notice of Assembly Biosciences, Inc.'s 2019 Annual Meeting of Stockholders and Proxy Statement and Annual Report for the fiscal year ended December 31, 2018 are available at [www.proxyvote.com](http://www.proxyvote.com).

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**ASSEMBLY BIOSCIENCES, INC.  
Annual Meeting of Stockholders  
May 17, 2019 8:00 AM PDT  
This proxy is solicited by the Board of Directors**

The Stockholder(s) hereby appoint(s) Derek A. Small and Graham Cooper, or either of them, as proxies, each with the power to appoint his substitute, and hereby authorize(s) each of them to represent and to vote, as designated on the reverse side of this ballot, all of the shares of common stock of ASSEMBLY BIOSCIENCES, INC. that the Stockholder(s) is/are entitled to vote at the Annual Meeting of Stockholders to be held at 8:00 A.M. PDT on May 17, 2019 at 331 Oyster Point Blvd., 4th Floor, South San Francisco, California 94080, and any adjournment or postponement thereof.

**This proxy, when properly executed, will be voted in the manner directed herein. If no such direction is made, this proxy will be voted in accordance with the Board of Directors' recommendations.**

**Continued and to be signed on reverse side**